

RADIOLOGY

The Oral Boards Primer

Amit Mehta, MD
Douglas P. Beall, MD



HUMANA PRESS

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The Oral Boards Primer

By

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Preface

One of the most difficult and stressful times in the career of any diagnostic radiologist is in the preparation for the oral board exam given by the American Board of Radiology. Oral boards often engender more angst than the written boards because the potential questioning could include any possible question or combination of questions and because the exam requires physical participation.

Radiology: The Oral Boards Primer is designed to provide information that is typical of that found on the oral board examination for diagnostic radiology. Cases are provided to illustrate typical pathology and to provide a visual source for the construction of a differential diagnosis. Once the differential is mentally rendered, the mnemonics may be used as a memory aid and to augment any missing components of the differential that would be considered important. The chapters are organized as close to the oral boards exam format as possible. The cases should be examined, interpreted, and completed in a very rapid fashion, allowing for many cases to be reviewed in a single sitting. The vast majority of the cases contain prototypical representations of pathology allowing this text to be used as a memory aid and as a case reference source for many years after one has taken and passed the oral board examination.

The book can be used both during residency and at the time of review for the oral board examination. *Radiology: The Oral Boards Primer* will assist greatly in the preparation for this examination and will contribute to the assuredness and confidence that comes from being adequately prepared. As always, a text can only improve through evaluation and evolution, and we welcome your comments.

A CD-ROM edition of the book (ISBN 1-58829-928-7), sold separately, is available for use on the reader's PC or PDA.

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An Approach to the Oral Boards

The oral boards attempt to cover a large amount of material in a short period of time. It is to your advantage to cover as much material as you can so that if one case does not go well, you have a big denominator to limit the significance of that particular case. As such, it is important to have an organized approach to each case. This not only shows the examiner that you are prepared, but also allows for an intelligent discussion.

THE 5Ds

Data
Detect
Describe
Differential
Diagnose

For each case use this approach.

1. Data

This is a quick description of the study and any pertinent data the examiner gives you: "This is a contrast-enhanced computed tomography scan of the chest in a 42-yr-old African-American female with a 1-yr history of shortness of breath."

2. Detect

After a quick review of the image, show the examiner you have found the pertinent abnormality: "The abnormality is throughout both lungs radiating from the hilar regions along the bronchovascular bundles."

3. Describe

Take a brief moment to describe the abnormality to show the examiner you are focusing on the correct finding. If you have incorrectly detected or described the abnormality, the examiner will redirect you to the correct path: "There is soft tissue opacity that spreads along the bronchovascular bundles from both hila. There is associated lymphadenopathy in both hilar regions and the mediastinum."

4. Differential

Use the mnemonics in this text to give a quick differential diagnosis: My top four considerations for this constellation of findings would include the following:

Sarcoidosis
Histoplasmosis or TB
Amyloidosis
Metastasis

5. Diagnose

Of the differential diagnoses you have provided, give the examiner your top choice and a reason: "Of these differential diagnoses, my top choice is sarcoidosis. The combination of the patient's demographic data and the finding of spread along the bronchovascular bundles associated with lymphadenopathy best supports this diagnosis."

1

Musculoskeletal Radiology

Includes plain film diagnosis in all areas of the musculoskeletal system plus any related special or imaging procedures, including CT, interventional techniques, and MRI.

GENERAL CASE CATEGORIES

1. General including Metabolic
2. Congenital
3. Tumors
4. Arthritis

General

BASILAR INVAGINATION

PF ROACH

Paget disease
Fibrous dysplasia
Rickets
Osteogenesis imperfecta, Osteomalacia
Achondroplasia
Cleidocranial dysplasia
Hyperparathyroidism, Hurler syndrome



SUBCHONDRAL CYSTS

COORS

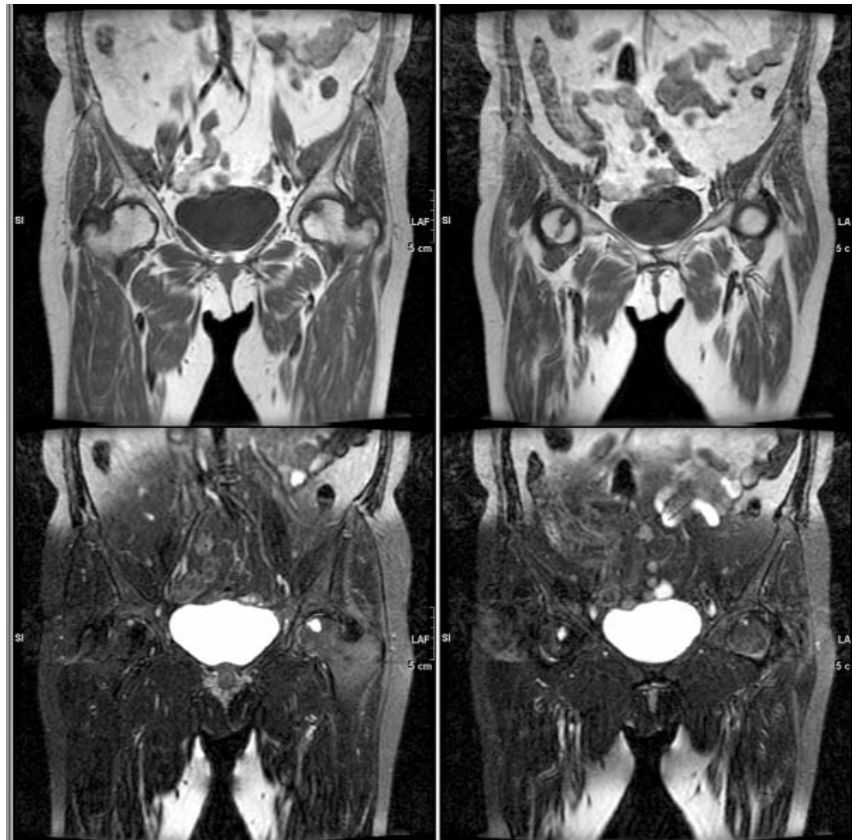
CPPD

Osteoarthritis

Osteonecrosis

Rheumatoid arthritis

Synovial-based tumors



ACETABULAR PROTRUSION

PROTrusion

Paget disease

Rheumatoid arthritis

Osteomalacia

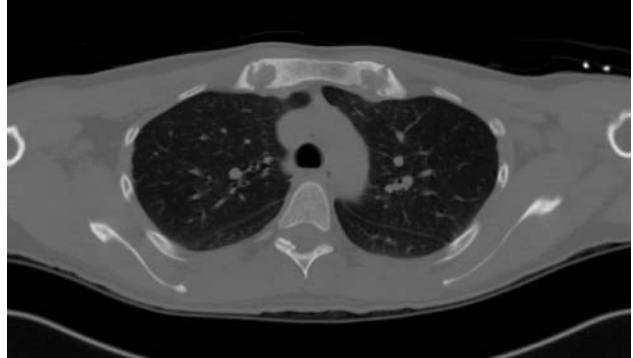
Trauma



STERNOCLAVICULAR SCLEROSIS

STOP

SAPHO syndrome
Traumatic osteolysis
Osteomyelitis/Osteosarcoma
Pagets



DISTAL CLAVICLE EROSION

SHIRT

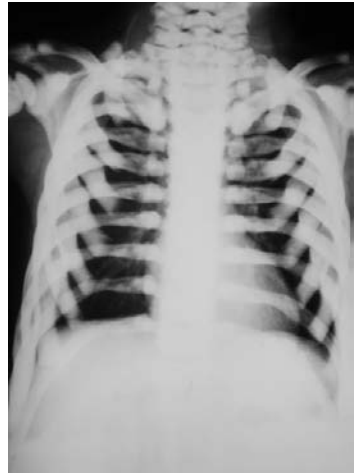
Scleroderma
Hyperparathyroidism
Infection
Rheumatoid arthritis
Traumatic osteolysis



SCLEROSIS-GENERALIZED

R.S.M.O.P.M.M.P.F. (Regular sex mnemonic)

Renal osteodystrophy
Sickle cell disease
Myelofibrosis
Osteopetrosis
Pyknodysostosis
Mastocytosis
Metastasis
Pagets
Fluorosis



OSTEONECROSIS

ASEPTIC

Anemias
Sickle cell disease/SLE
ETOH/Exogenous steroids
Pancreatitis
Trauma
Infection
Caisson's disease



ACRO-OSTEOLYSIS

PINCH FO

Psoriasis
Infection
Neuropathic
Collagen vascular disease
Hyperparathyroidism
Familial (Hadju Cheney)
Other—polyvinyl alcohol



CHONDRAL CALCIFICATION

HOGWASH

Hyperparathyroidism

Ochronosis

Gout

Wilson's Disease

Arthritis

Pseudogout

Hemochromatosis

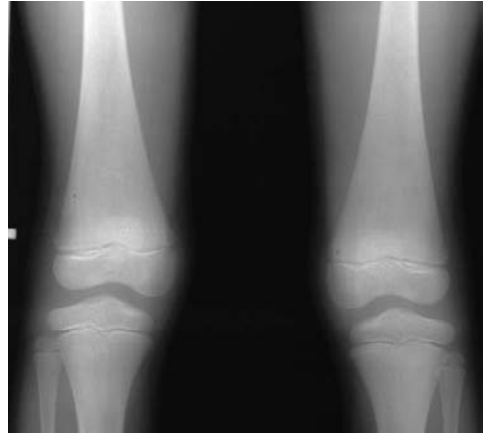


Congenital

ERLYMEYER FLASK

CHONGO

Craniometaphyseal dysplasia
Hemoglobinopathies
Osteopetrosis
Niemenn Pick
Gaucher's Disease
Other



METAPHYSEAL BANDS

DENSE

LINES

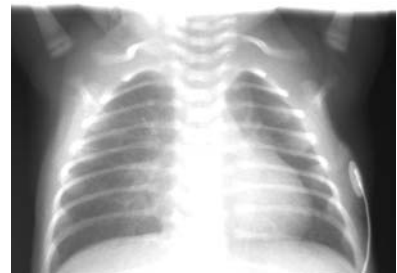
Lead poisoning
Infantile growth arrest
Normal, 3 yr
Leukemia treated
Syphilis



LUCENT

NORMAL TENDER LOVING CARE

Normal (neonates)
TORCH
Leukemia
Chronic illness



GRACILE BONES

NIMROD

Neurofibromatosis
Immobilization
Muscular dystrophy
Rheumatoid arthritis
Osteogenesis imperfecta
Dysplasias



MADELUNG DEFORMITY

HITDOC

- H**urler syndrome
- I**nfection
- T**rauma
- D**yschondrosteosis
- O**steochondroma
- C**ongenital–Turner’s syndrome



SHORT METACARPALS

BIC PEN

- B**asal Cell Nevus syndrome
- I**diopathic
- C**hromosomal–Turner’s syndrome
- P**seudohypoparathyroidism/PseudoPseudo-hypoparathyroidism



Tumors

DIAPHYSEAL LESIONS IN GENERAL

CEMENT

- Cysts
- Enchondroma
- Metastasis
- Eosinophilic granuloma (EG)
- Non-ossifying fibroma (NOF)
- TB/infections



CORTICAL LESION

MOFOS

- Metastasis
- Osteomyelitis
- Fibrosarcom
- Osteoid osteoma
- Stress fracture



ILIAC WING LESIONS

Fibrous dysplasia
Unicameral bone cyst
Chondrosarcoma
Mets/Myeloma/Plasmacytoma
Ewings



VERTEBRA PLANA

IMELT

Infection
Mets/Myeloma
EG
Lymphoma/Leukemia
Trauma



BONY SEQUESTRUM

LIFE

Lymphoma
Infection
Fibrosarcoma
EG



RIB LESION

FAME

Fibrous dysplasia
ABC
Metastatic/Myeloma/Lymphoma
EG/Enchondroma



EPIPHYSEAL LESIONS

CIGS

- Chondroblastoma
- Infection
- Giant cell tumor/Granuloma (EG)
- Subchondral cyst



FOCAL SCLEROTIC LESION

HOME LIFE

- Healed NOF
- Osteoma
- Metastasis
- Ewing's sarcoma
- Lymphoma
- Infection/Infarct
- Fibrous dysplasia
- Enchondroma



PERMEATIVE LESIONS

FIRE

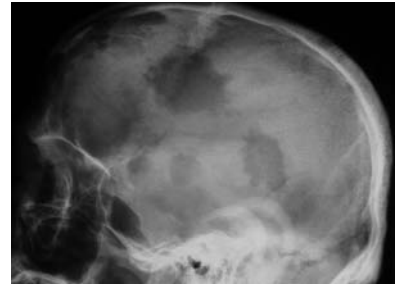
- Fibrosarcoma (Desmoid/MFH)
- Infection
- Round cell tumors
- EG
- Mets/Myeloma



SKULL LESION

MEL TORME

Metastasis
EG
Lymphoma
TB
Osteomyelitis
Radiation
Mets
Epidermoid



TIBIAL LESION

FOAM

Fibrous dysplasia
Osteofibrous dysplasia
Adamantinoma
Metastasis



POSTERIOR VERTEBRAL BODY LESION

GO TAPE

Giant cell tumor
Osteoblastoma
TB
ABC
Paget disease
EG



CALCANEAL LESION

BIG G

Bone cyst-unicameral
Intraosseous lipoma
Ganglion
Giant cell tumor



FINGER TIP LESION

GEMS

Glomus tumor
Epidermoid/Enchondroma
Metastasis (lung almost exclusively)
Sarcoid



SOFT TISSUE CALCIFICATION/OSSIFICATION

My GHOSTS

Myositis ossificans
Gout
Hyperparathyroidism
Ochronosis
Scleroderma/connective tissue disease
Tumoral calcinosis
Sarcoma (synovial cell)



SACRAL LESION

CAN

Chondrosarcoma/Chordoma

ABC/GCT

Neurofibromatosis

And always Mets/Myeloma/Lymphoma



FLUID-FLUID LEVEL

HOT MASS

Hemangioma

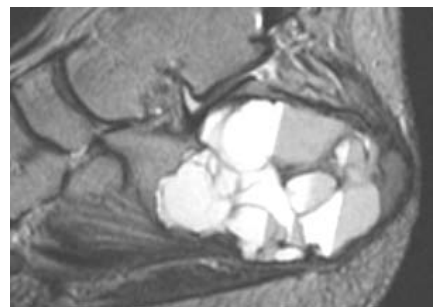
Telangiectatic osteosarcoma

Metastasis

ABC/GCT

Synovial cell

Sarcoma



Arthritis

INFLAMMATORY ARTHRITIS

1. RF+

Rheumatoid Arthritis

–Symmetric

SLE

–Subluxation/nonerosive

Scleroderma

–DIP, PIP erosions

–Soft tissue Ca^{2+}

–Acroosteolysis

Dermatomyositis

–Soft tissue Ca^{2+}

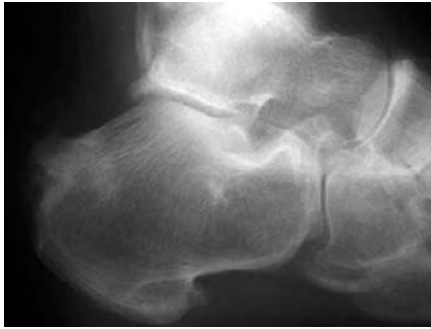


2. RF–***Ankylosing Spondylitis***

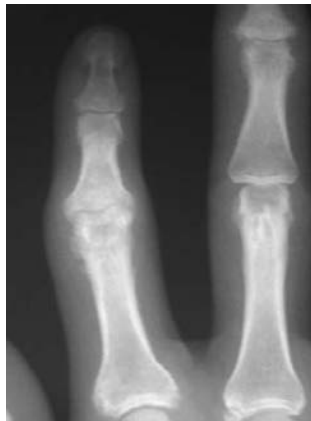
- SI joint involvement

***Reiters***

- Foot > Hand
- Bony Proliferation

***Psoriasis***

- Erosive
- Bony proliferation
- Asymmetric
- Sausage digit
- Ivory phalanx
- Pencil in cup

***Inflammatory Bowel Disease (IBD)***

- Arthritis with IBD

3. EROSIVE OA

–Dip Joints



CRYSTAL ARTHRITIS

1. DEPOSTION

Gout

- Marginal erosions
- Overhanging edges
- Preserved joint space



CPPD

- ChondroCa²⁺
- Cysts
- 2nd and 3rd MCP
- SLAC
- TFCCa²⁺



2. OTHER

Hemochromatosis

Acromegaly

Other

Ochronosis

–Disc calcification

Multicentric reticular histiocytosis

–Symmetric

–No osteopenia

Infection

–Crosses Joint Space



OH MY GOD LESIONS

**VERY BIZARRE LOOKING GENERALIZED
LESIONS THAT YOU HAVE NO IDEA
WHAT IT IS, THINK OF:**

- Paget disease
- Fibrous dysplasia
- Neurofibromatosis
- Charcot joints



Metabolic

OSTEOPENIA

GENERALIZED

- Senile osteoporosis
- Osteomalacia
- Endocrine abnormalities
 - Cushings (too much)
 - Hypogonadism (too little)
- Anemia/Myelofibrosis/Gauchers
 - Bone marrow
- Congenital
 - Osteogenesis imperfecta
- Hyperparathyroidism



FOCAL

Reflex sympathetic dystrophy (complex regional pain syndrome)

Disuse

Transient osteoporosis

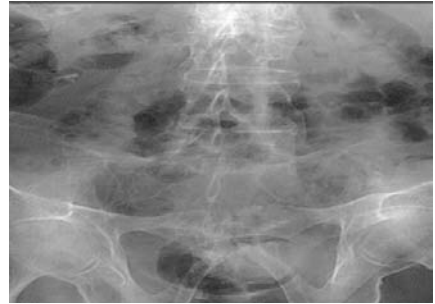
Migratory osteoporosis



SPINE

CALCIFICATION OF THE ANNULUS FIBROSUS

- Ankylosing spondylitis
 - Disks unremarkable
- Ochronosis
 - Disks calcified
 - Abn SI joints



OSTEOPHYTES

- DISH
 - Disks unremarkable
 - Normal SI joints



SYNDESMOPHYTES

Psoriasis
Reiters

MARGINAL OSTEOPHYTES

Spondylosis or degenerative

**OSTEOPHYTOSIS**

ARTHRITIS BASICS AND ARTHRITIS BY LOCATION

ABCDS	Alignment
	Bone
	Cartilage/calcifications
	Distribution
	Soft tissues

Wrist

- 1st CMC, TFC—CPPD
- Radiocarpal joint—osteoarthritis
- CMC—gout (marginal erosions)

Hand

DIP + PIP

- Osteoarthritis
 - Osteophytes
 - No erosions
- Erosive osteoarthritis
 - Osteophytes
 - Erosions
 - Females
- Psoriasis/Reiters
 - No osteophytes
 - Erosions

MCP + PIP

- Rheumatoid
 - Erosions
 - No osteophytes
 - Osteopenia
- Psoriasis/Reiters
 - Erosion
 - Bony proliferation

MCP

- Inflammatory
 - Erosions
- CPPD/hemochromatosis
 - Osteophytes

Foot

MTP JOINTS

- RA
- Gout
- OA
- Neuropathic

MIDDLE/HINDFOOT

- RA
- Osteoarthritis

Hip

BONY PROLIFERATION

- OA
 - Superolateral migration
- Ankylosing spondylitis
 - Axial migration
 - SI joint involvement symmetric
- Psoriasis/Reiters
 - Axial migration
 - SI joint involvement asymmetric
- CPPD
 - Chondrocalcinosis

NO . PROLIFERATION

- RA
 - Acetabular protrusio
 - Osteopenia

Knee**COMPLETE JOINT INVOLVEMENT****RA**

- No bony proliferation
- Osteopenia
- Cyst formation

JRA/hemophilia

- Wide femoral notch
- High density effusion

Psoriasis/Reiter's

- Asymmetric
- Bony proliferation

MEDIAL INVOLVEMENT

Osteoarthritis

PATELLOFEMORAL INVOLVEMENT

CPPD

Shoulder**GLENOHUMERAL JOINT****CPPD**

- vs osteoarthritis—not a weight-bearing joint

ACROMIOCLAVICULAR JOINT**Rotator cuff tear**

- Glenohumeral joint spared

TOTAL JOINT INVOLVEMENT**Rheumatoid**

- Symmetric

NORMAL JOINT SPACE

Hydroxyapatite crystal deposition disease

NAMES TO KNOW

UPPER EXTREMITY

Mallet Finger
Bennett's
Rolando
Gamekeeper
Boxer's
Colle's
Smith's
Chauffer's (Hutchinson's)
Barton's
Rev. Barton's
Nightstick
Monteggia
Galeazzi
Hill Sach's
Bankart

LOWER EXTREMITY

Jones
Lisfranc
Choparts

Maisonneuve

Tillaux
Wagstaffe-Lefort

SPINE

Jefferson
Hangman
Clay Shovelers
Lefort I
Lefort II
Lefort III

LOCATION OF INJURY

Dorsal Base DP
1st MC base, intraarticular
Communitied
1st PP ulnar
5th MC
Distal radius
Reverse colles
Radial styloid
Dorsal rim
Anterior rim
Ulnar shaft isolated
Ulna and radial + dislocation (elbow)
Ulna and radial + dislocation (wrist)
Humeral head
Glenoid

LOCATION OF INJURY

5th MT base
2-5 MT
Talonavicular and calcaneocuboid
dislocation
Pronation external rotation injury-
proximal fibula
Anterior tibial tubercle
Fibular avulsion

LOCATION OF INJURY

C1 lateral masses
C2 pars Fx
Posterior elements
Through maxilla
Nasal—inferior orbital rims
Nasal—orbits

2

Chest Radiology

Includes plain film diagnosis, CT, MRI, and interventional techniques used in the diagnosis of diseases of the lungs, pleura, and mediastinum including the heart and great vessels.

LYMPHANGITIC CARCINOMATOSIS

“CERTAIN CANCERS SPREAD BY PLUGGING THE LYMPHATICS”

Cervix
Colon
Stomach
Breast
Pancreas
Thyroid
Larynx

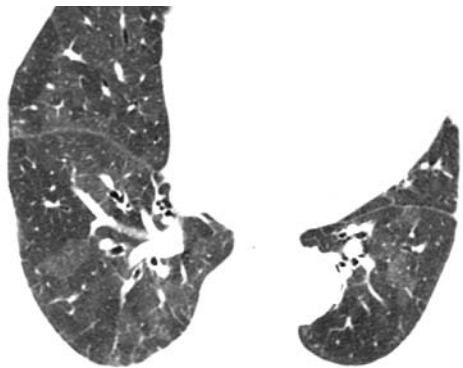
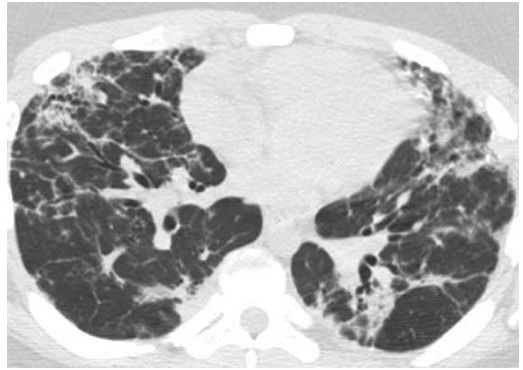


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BRONCHIOLITIS OBLITERANS

CRITTERS

COP/BOOP
 Rheumatoid
 Infectious-Swyer James
 Transplant
 Toxins
 Sarcoid



MULTIPLE NODULES OR MASS >3 CM

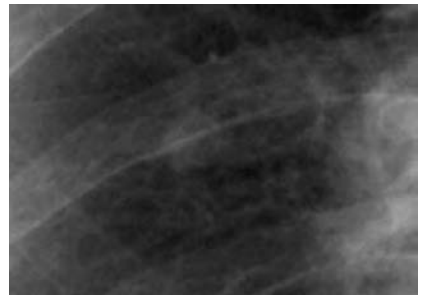
DAYS OF THE WEEK: MTWTFSS

Mets/Carcinoma/Lymphoma
 TB/granuloma
 Wegeners
 Rheumatoid nodules/Round pneumonia
 Fungal
 Sarcoid
 Septic pulmonary emboli



COIN LESION <3 CM**CHANGE**

Carcinoma/Congenital
Hamartoma/Hematoma
AVM/Abscess
Neoplasm–mets
Granuoma
Esoteric-TB pneumonia



A CT scan should be done to assess:*Ca²⁺ pattern*

Benign: solid, lamellated, central

Malignant: stippled, any other pattern.

Density: fat - Hamartoma

Margins:

Spiculated suggestive of carcinoma

Enhancement

Four 1-min images >15HU suggestive

*Growth***CAVITY****CAVITY**

Carcinoma-SCC

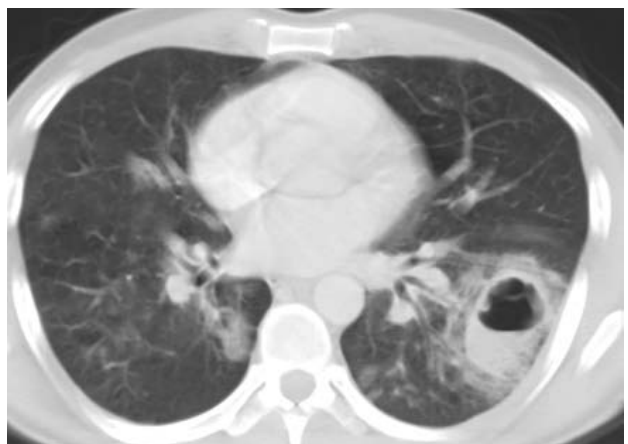
Abscess-fungal/bacterial/TB

Vascular-septic emboli

Inflammatory-rheumatoid nodule

Trauma-resolving contusion

Young-bronchogenic cyst



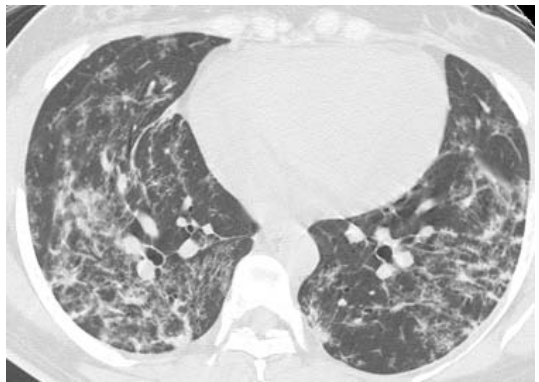
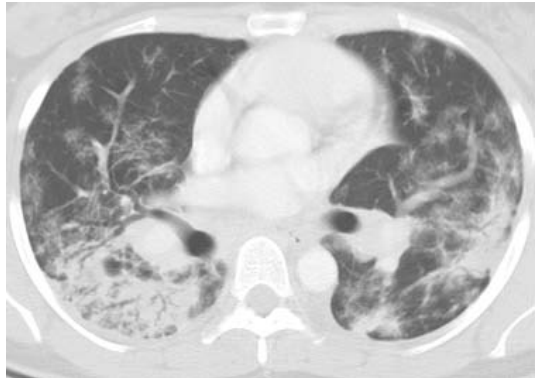
CAVITY (*continued*)



BRONCHOVASCULAR SPREAD

SKILL

Sarcoid
Kaposi
Infection–PCP/TB
Lymphoma
Lymphagitic spread



UNILATERAL HYPERLUCENT LUNG

POEMS

Poland syndrome/Pneumothorax
Oligemia/Obstruction (PE)
Emphysema
Mastectomy
Swyer James



ACUTE INTERSTITIAL DISEASE (RETICULAR)

HELP

Hypersensitivity pneumonitis
Edema-Inhalation injuries
Lymphoproliferative
Pneumonia-atypicals, PCP



CHRONIC INTERSTITIAL DISEASE (RETICULAR)

PAGE CHUCK AT THE CIA RIGHT NOW, THERE'S DRUGS

UPPER LUNG ZONES

Pneumoconiosis
Ankylosing spondylitis
Granulomatous
Eosinophillic
Sarcoid/Silicosis



MID LUNG ZONES

Chronic Hypersensitivity



LOWER LUNG ZONES

Collagen vascular disease

IPF

Asbestos

Rheumatoid

NF

Drug toxicity



ACUTE AIRSPACE DISEASE

HELP LEGALIZE HEMP

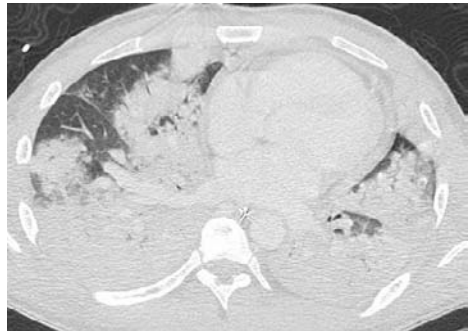
DIFFUSE

Hemorrhage

Edema

Lymphoproliferative—esoteric

Pneumonia



FOCAL

Hemorrhage-contusion/PE

Edema-inhalation (crack)

MI (RUL)

Pneumonia



CHRONIC AIRSPACE DISEASE

PEBBLES

PAP/PCP/Pedema

Eosinophilic pneumonia

BAC

BOOP

Lymphoma

Esoteric-Wegener's/TB

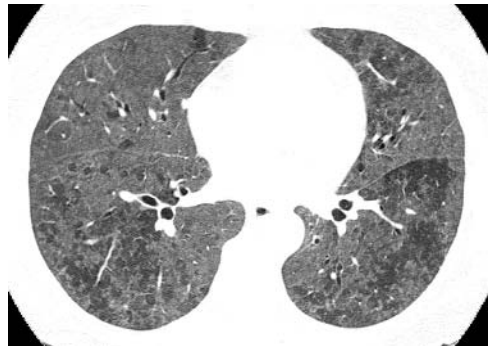
Sarcoid/Septic pulmonary emboli



GROUND GLASS DIFFUSE OPACITY

SHAKE YOUR HIPS IN BED

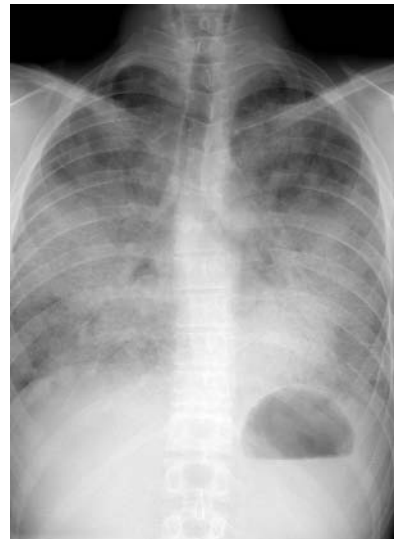
Sarcoid
Hypersensitivity—smokers
Infection
Pneumonitis—DIP
Scleroderma/CVD
BOOP
Edema/aspiration
Drug toxicity



CENTRAL OPACITIES EXTENDING FROM THE HILA OUTWARDS

PPPP

PAP
Pulmonary edema
PCP
Pneumonia—atypical/influenza



MIDDLE MEDIASTINAL MASS

HABIT

Hernia, Hematoma

Aneurysm

Bronchogenic cyst/duplication cyst

Inflammation (sarcoidosis, histoplasmosis, coccidioidomycosis, primary TB in children)

Tumors—remember the five Ls:

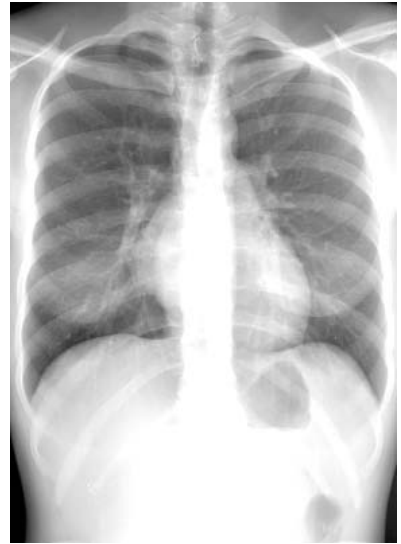
Lung, especially oat cell

Lymphoma

Leukemia

Leiomyoma

Lymph node hyperplasia



RETICULAR (CXR)/CYSTIC OPACITIES (CT)

ELECT CHIP

EG

LAM

Emphysema

CF

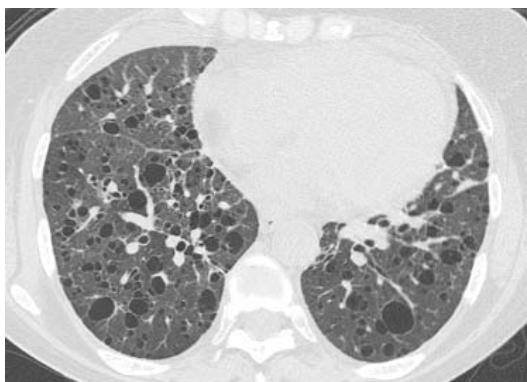
TS

Coccidiomycosis

Hydrocarbon

Infectious

PCP



FINGER IN GLOVE OPACITIES

CACACA

CF

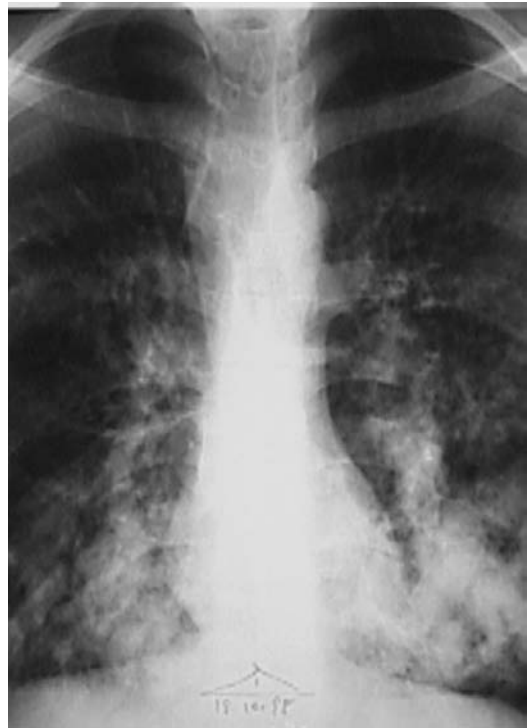
Asthma

Congenital bronchial atresia

ABPA

Cancer

AVM



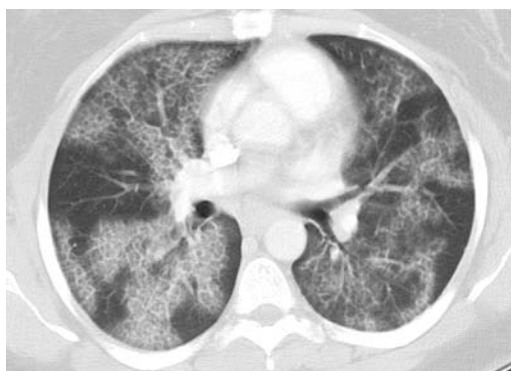
CRAZY PAVING (CT)

ACUTE

Edema
Hemorrhage

CHRONIC

PAP
Sarcoid
PCP
Fibrosis



END-STAGE LUNG (CXR)— ARCHITECTURAL DESTRUCTION

TESSA

TB

EG

Sarcoid

Silicosis

ARDS—The sequela of



CA²⁺ NODULES

MASH POX

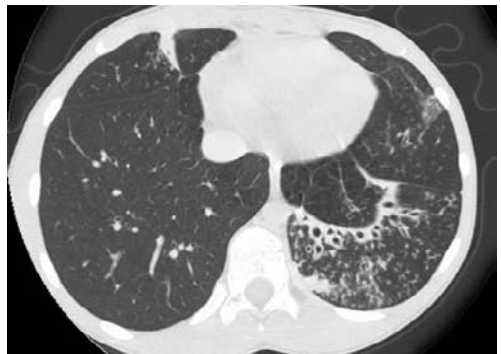
Metastatic disease
Alveolar microlithiasis
Silicosis/siderosis
Histoplasmosis
Pox (Varicella)



TREE IN BUD OPACITIES (CT)

MIT

Mucous plugging: Aspiration/Kartagener's
Inflammatory plugging (PUS): TB/MAI
Tumor emboli (rare)

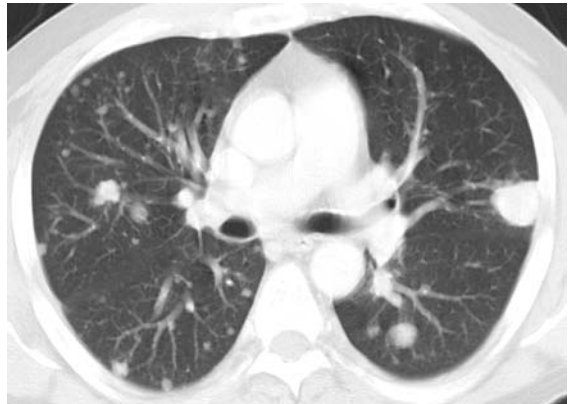


NODULES (CT)

DIFFUSE

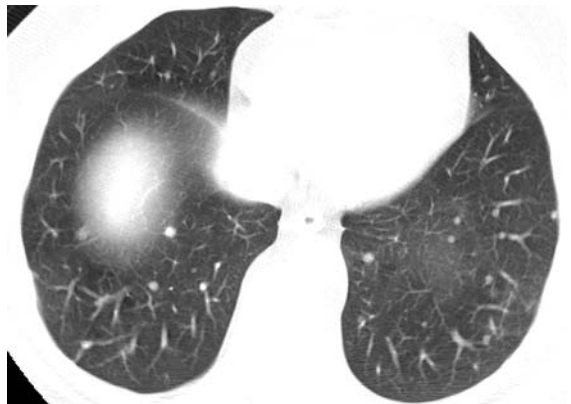
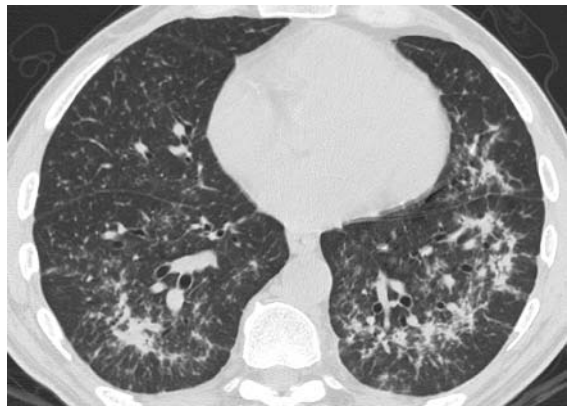
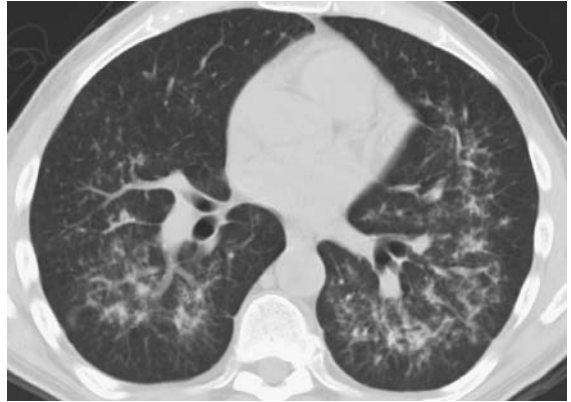
MISSLE

Mets
Infection
Sarcoid
Silicosis
Lymphoma
EG



PERILYMPHATIC**A SKILL**

Amyloid
Sarcoid
Kaposi's
Infection (PCP)
Lymphoma
Lymphang carcinomatosis



CENTRIOLOBULAR

HERB HAS GAS

Hypersen pneumonitis

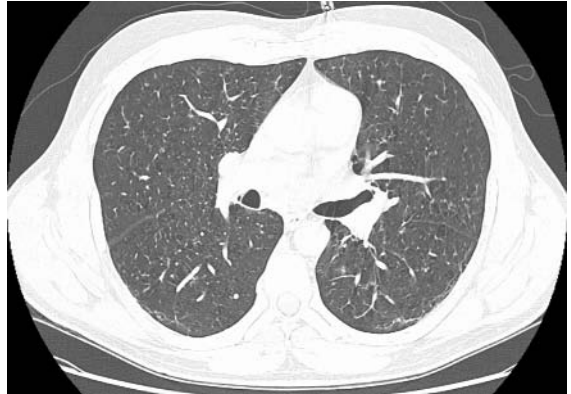
EG

RB-ILD

BAC/BOOP

GVHD

VASculitis



BRONCHIECTASIS

CAPT KANGAROO HAS MOUNIER KUHN

Cystic fibrosis

ABPA

Postinfectious

TB

Kartagener's

Mounier Kuhn



TRACHEAL NEOPLASMS

Multiple

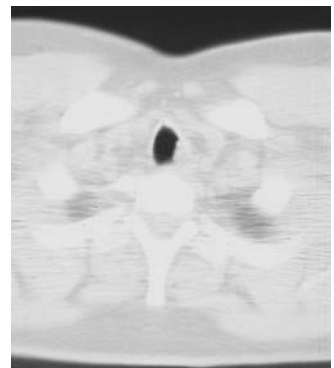
TRAM

Tracheobronchopathia
Relapsing polychondritis
Metsastasis

Single

MATCH

Mucoepidermoid
Adenoid cystic
Tracheal SCC
Carcinoid
Hamartoma



Cardiac

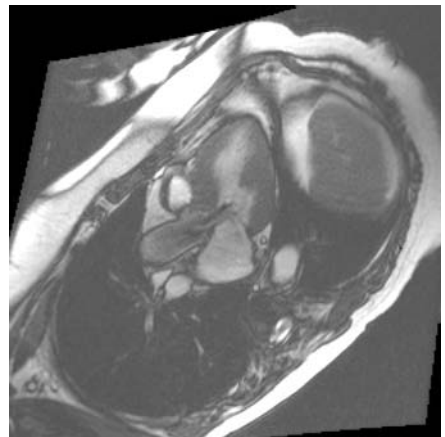
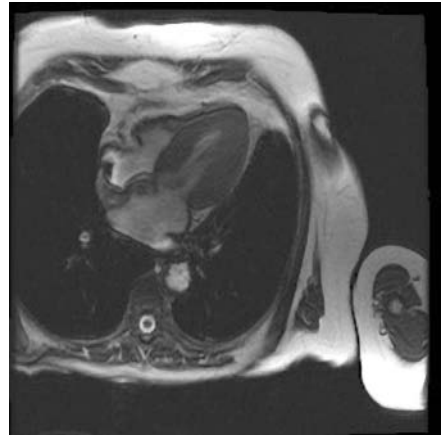
CARDIOMYOPATHY

RESTRICTIVE

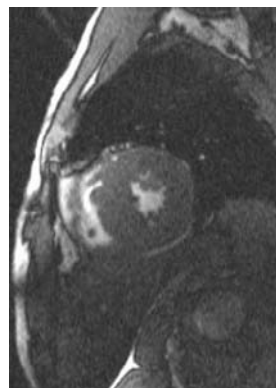
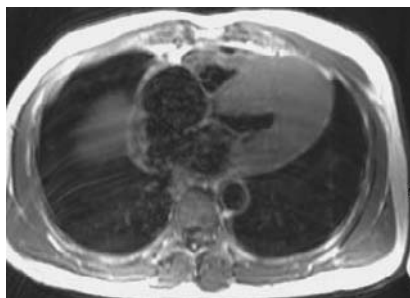
- Sarcoid
- Hemochromatosis
- Amyloid
- Endocardial fibroelastosis

HYPERTROPHIC

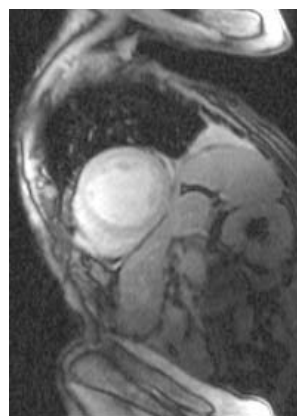
- Obstructive
- Nonobstructive



Dilated



PERICARDIUM



CA²⁺

Uremic

Viral

TB

Prior hemorrhage



3

Gastrointestinal Radiology

Includes plain radiograph interpretation, contrast studies of the GI tract and abdominal imaging studies including CT, MRI, and ultrasound, plus interventional techniques related to the esophagus, stomach, small and large intestines, biliary tract, liver, spleen, pancreas, peritoneal cavity, and abdominal wall.

GENERAL

1. The Gastrointestinal Mantra: Always consider the three following categories in the GI tract, almost all cases shown will encompass:

- a. Neoplasm
- b. Infection
- c. Inflammatory

2. In GI, when all else fails, think: TB, CROHN'S, LYMPHOMA, METS. It will save you 90% of the time.

PLAIN FILM

HAVE A SYSTEMATIC APPROACH ON THE BOARDS. It goes quickly so you must do this on all films.

“ABCD”

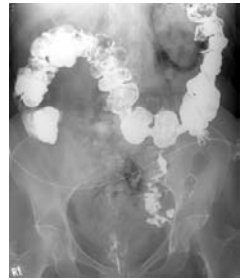
AIR (MISSING THESE = FAIL)

1. Portal vein
2. Emphysematous cholecystitis
3. Emphysematous pyelonephritis
4. Emphysematous cystitis
5. Retroperitoneal air
6. Free air
7. Pneumatosis



BOWEL

Pattern
Location
Hernia



CALCIUM

Gallbladder
Renal
Appendix
Bladder
Aneurysms



DEM BONES

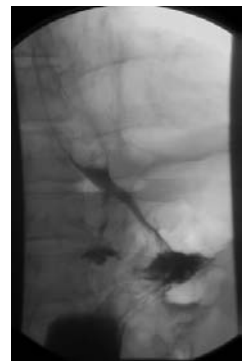
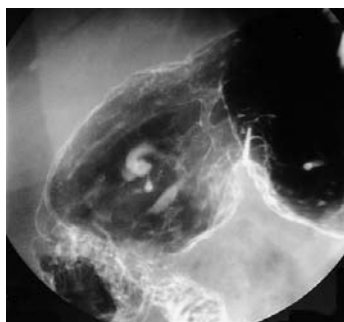
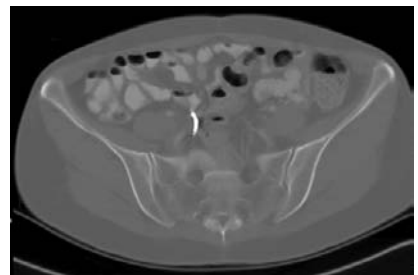
Lytic pedicles will signify RCC on board exams.



ABNORMAL COLLECTION OF BARIUM ANYWHERE

FED UP

Fistula
Extravasation
Diverticulum
Ulcer
Perforation



Esophagus

MASS

CALL the MVP

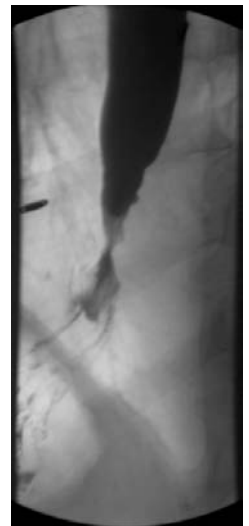
Carcinoma
Adenoma/Polyp/Papilloma
Lymphoma
Leiomyoma
Metastasis
Varices
Papilloma



ULCERATION/STRICTURE

CAR RIMS

Caustic or NG/Crohn's
Adenocarcinoma
Reflux
Radiation
Infection/inflammatory
Metastasis
Skin – Bullous/Pemphigus



ESOPHAGEAL FILLING DEFECTS

Candida

Glycogenic Acanthosis/Acanthosis Nigricans

Leukoplakia



ESOPHAGEAL MOTILITY DISORDER

PRIMARY

Achalasia

Nonspec Esop Motility Dz

Presbyesophagus

DES



SECONDARY

Scleroderma

Diabetes

Infection-Chagas

Esophagitis-reflux/radiation



DIVERTICULI

High

PULSION-Zenker's



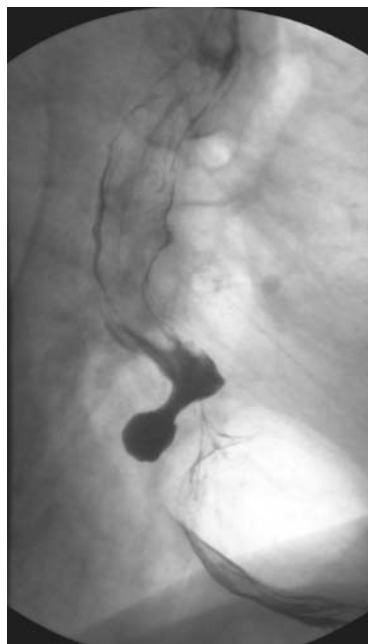
Mid

TRACTION-TB/Histoplasmosis



Low

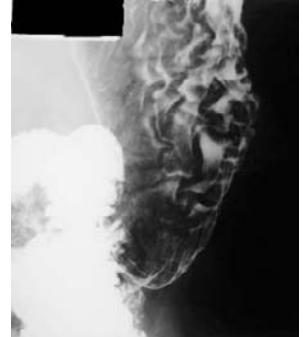
EPIPHRENIC



Stomach

GASTRITIS

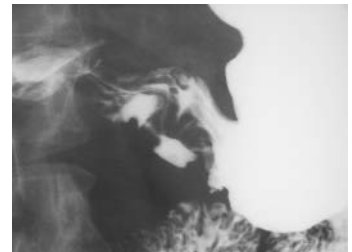
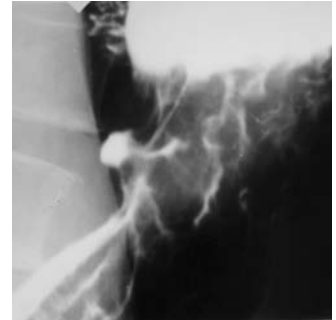
Fold Thickening



GASTRIC ULCERS

Benign

Thin folds
Beyond lumen
Eccentric crater
+ Hampton
N Peristalsis



Malignant

Thick fold
Within lumen
Central crater
– Hampton
Abn Peristalsis



APTHOUS ULCERS

ACHE BABY

ASA/meds

Crohn's

Herpes

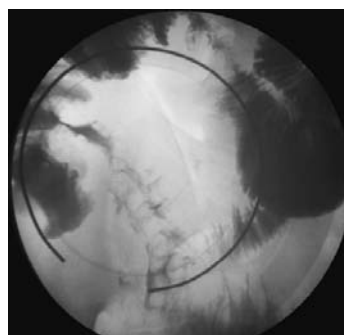
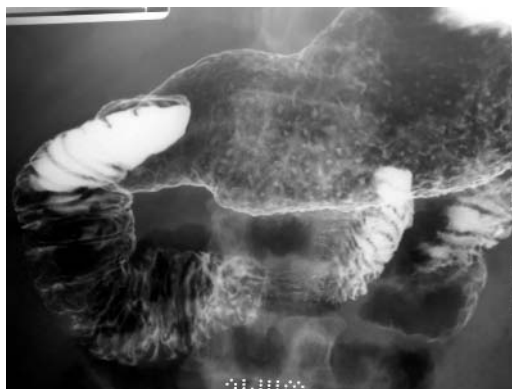
ETOH

Behcet

Amebiasis

Bad AIDS

Yersenia



ANTRAL NARROWING

CTL SPINE (AS IN CTL: CERVICAL/THORACIC/LUMBAR)

Crohn's

TB

Lymphoma/carcinoma/mets

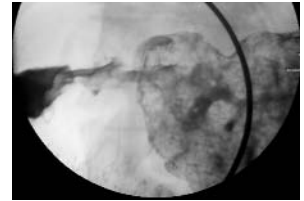
Sarcoid

Prior ulcer/Atrophic gastritis

Ingestion (caustic)

Eosinophilic gastroenteritis

Chronic granulomatous dz childhood (Pediatrics only-for the 72)



FOLD THICKENING

LAMAZE CLASSES

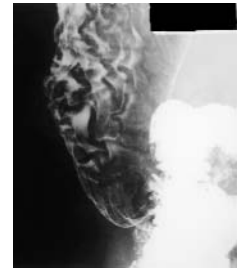
Lymphoma

Adenocarcinoma

Menetriers

Zollinger Ellison

Eosinophilic gastritis



GASTRIC MASS

CALL ME

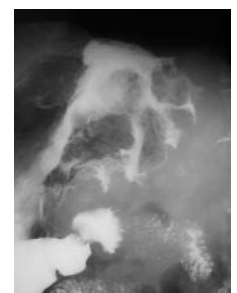
Carcinoma

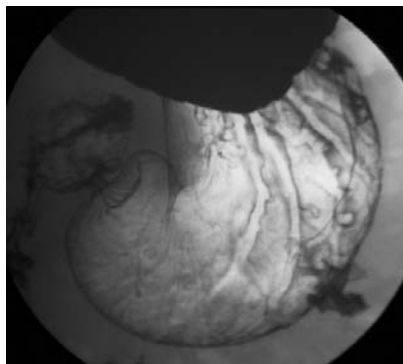
Adenoma/Hyperplastic polyps

Lymphoma

Leiomyoma/Lipoma

MEtastasis



CALL ME (continued)**LINITIS PLASTICA****GRAM STAIN**

Granulomatous infection
(TB)/Crohn's/Lymphoma

Radiation

Adenocarcinoma

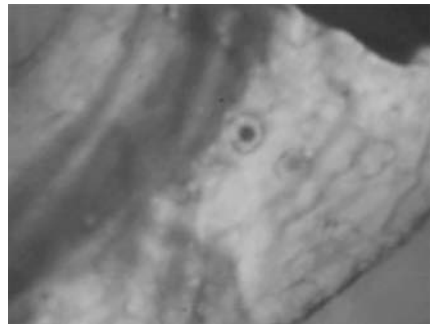
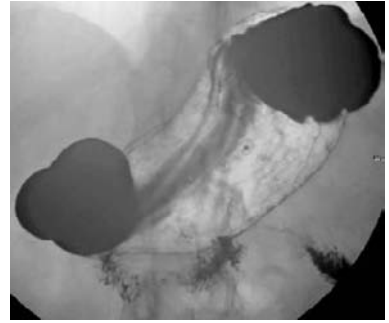
Metastasis-breast



BULLSEYE/TARGET LESION

BLACK

Breast metastasis/Melanoma metastasis
Leiomyoma
Adenocarcinoma
Cancer-lymphoma
Kaposi



DOUBLE CHANNEL PYLORUS

ULCER

Ulcer disease
Lymphoma
Crohn's
Endoscopy induced injury
Radiation

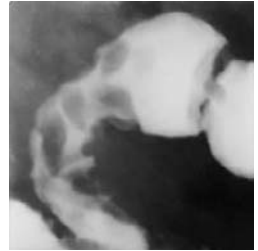


Duodenum

ANTRAL/DUODENAL FILLING DEFECTS

BLED

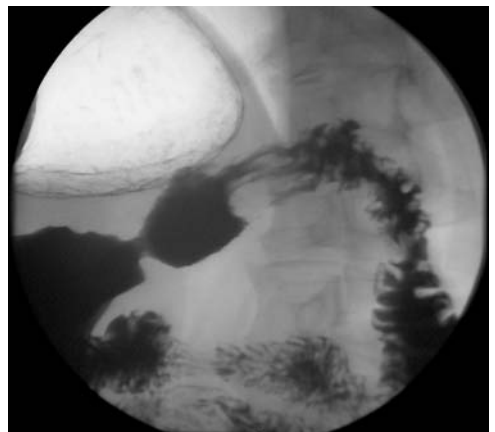
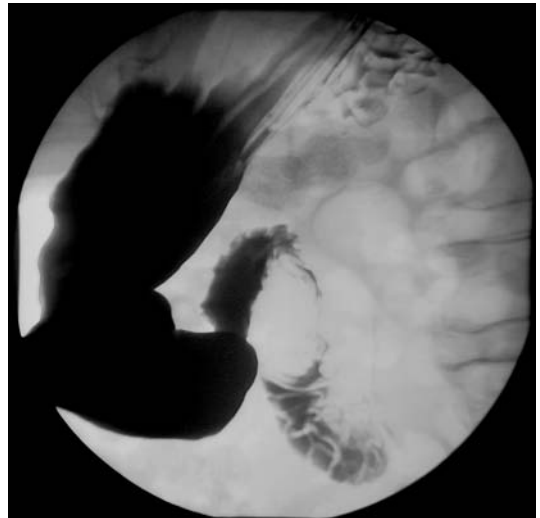
Brunner's gland hyperplasia
Lymphoid hyperplasia
Ectopic gastric mucosa
Duodenitis



BULBAR MASS

ABCDE

Ampulla
Brunner's gland adenoma
Crohn's
Duodenal adenocarcinoma
Ectopic pancreas



DUODENAL ULCER

PAT

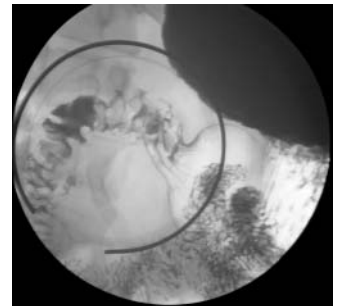
Peptic ulcer
Adenocarcinoma
TB/Crohn's/Lymphoma



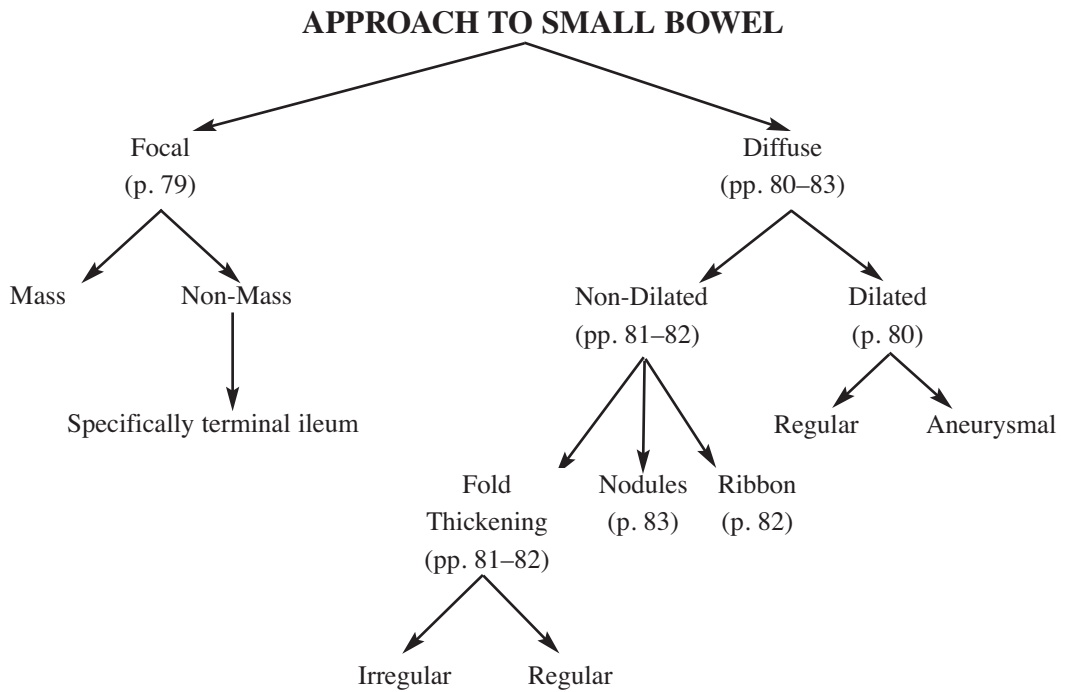
DUODENAL FOLD THICKENING

PAD LOCZS

PAⁿcreatitis
Duodenitis-ETOH/meds
LymphOma
Cystic Fibrosis/Crohn's
Zollinger Ellison
Sprue/strongyloides



Small Bowel



FOCAL PROCESS

ANYWHERE

- Ischemia
- Crohn's
- Neoplasm
- Radiation

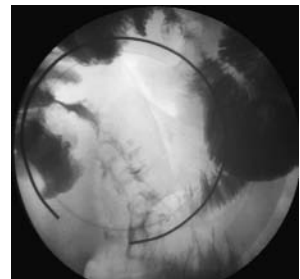


TERMINAL ILEUM (exclude appendix and cecal processes)

- TB
- Crohn's
- Lymphoma
- Mets
- Infection (specific to the TI)

Your S Smells Totally Awful

- Yersinia
- Shigella
- Salmonella
- TB
- Actinomycosis



DIFFUSE***SMALL BOWEL******Dilated*****SOS**

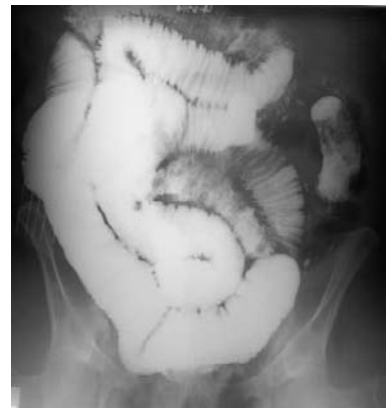
Sprue
Obstruction
Scleroderma

OR***Wet Pattern***

Sprue
Zollinger Ellison
Lymphoma

Dry Pattern

Obstruction
Scleroderma
Radiation

***SMALL BOWEL******Aneurysmal Dilatation*****MALL**

Metastasis
Abscess/Hematoma
Lymphoma
Leiomyosarcoma



SMALL BOWEL FOLDS

Irregular Thickening

MALE COW

MAI

Amyloid

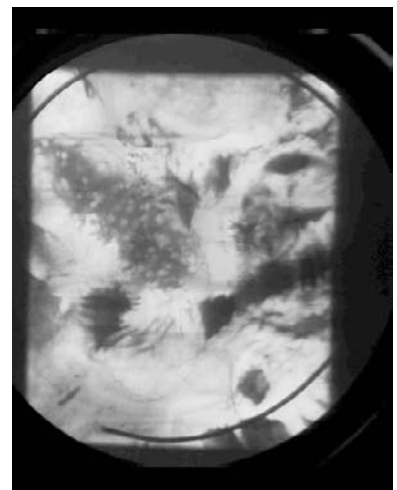
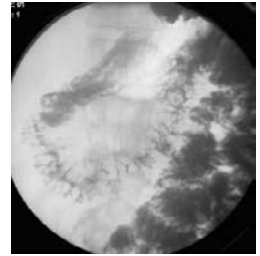
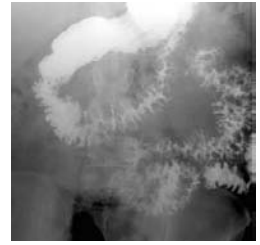
Lymphoma

Eosinophilic Gastroenteritis

Crohn's

Other-Giardiasis

Whipple



SMALL BOWEL FOLDS***Regular Thickened "Picket Fence"*****HEMORRHAGE**

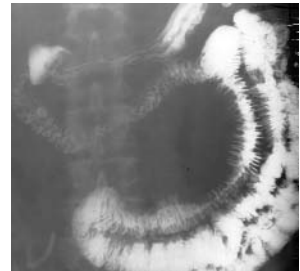
HSP
Anticoagulation

EDEMA

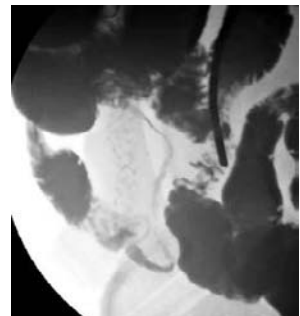
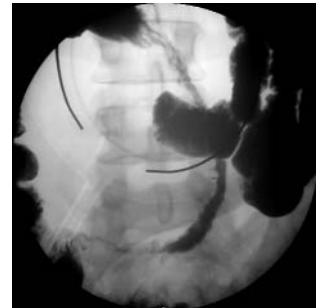
CHF
Hypoproteinemia

OTHER

Lymphoma
Lymphagectasia
Radiation

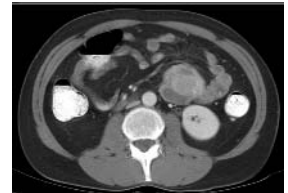
**SSMALL BOWEL*****Ribbon Bowel*****A CUTE GIRL**

Amyloid
Cryptosporidiosis
GVHD
Ischemia/Infection
Radiation
Lymphoma

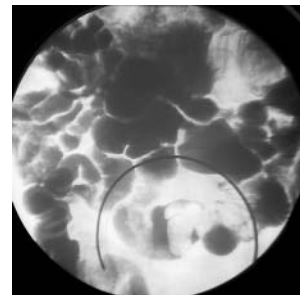


SMALL BOWEL**Masses****LACK**

Leiomyoma
Adenocarcinoma
Carcinoid
Kaposi

**SMALL BOWEL****Nodules****MACE KILLS**

Mastocytosis/Macroglobunemia
Amyloid
Crohn's
Eosinophilic enteritis
Kaposi



Colon

POLYPS

SINGLE

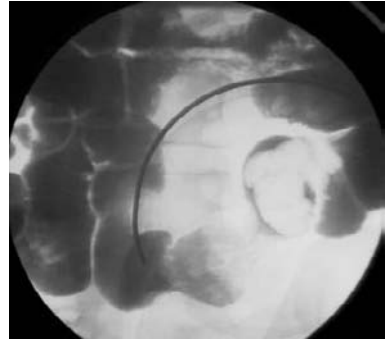
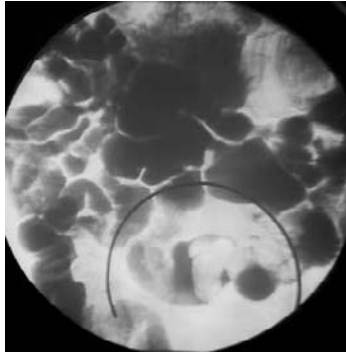
- Hamartomatous
- Adenoma-tubular/tubulovillous/villous
- Hyperplastic
- Lymphoma
- Inflammatory-UC/Crohn's



MULTIPLE/POLYPOSIS

1. *Hamartomas*

Peutz-Jaeger: (MUCOCUTANEOUS)

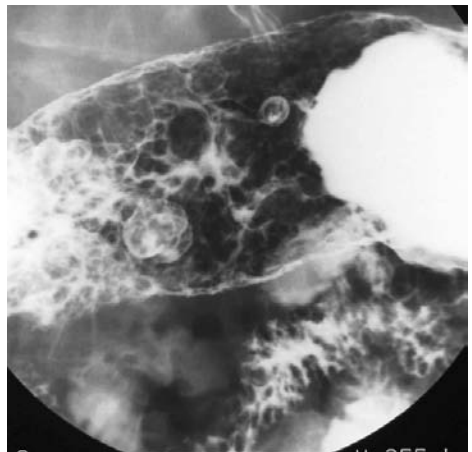
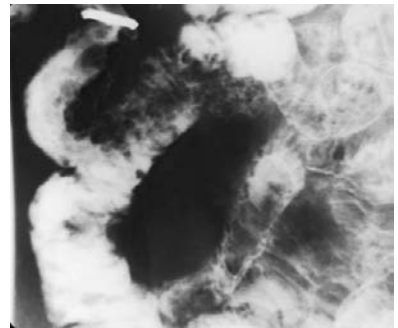
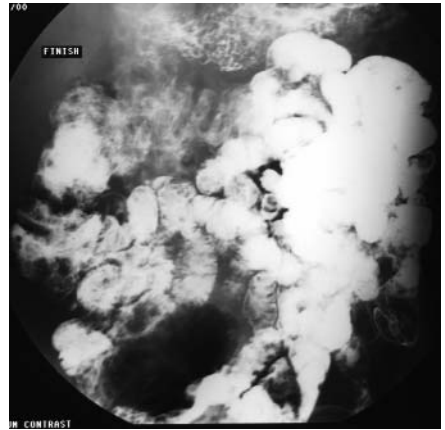


2. *Hyperplastic*

Juvenile Polyposis (Children are ***HYP***ER)



Cronkhite Canada:
(CHECK STOMACH FOR POLYPS)



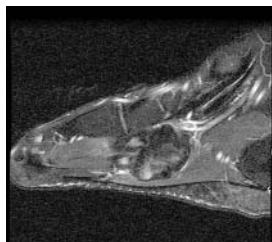
3. Adenomatous

FiGhT

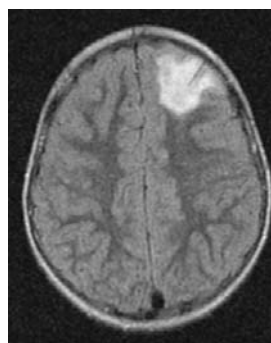
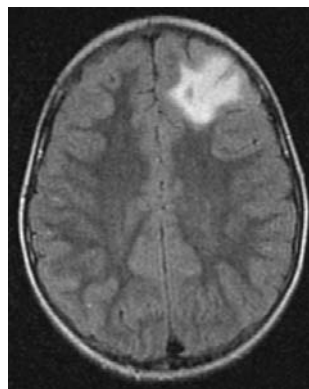
Familial Polyposis



Gardner's



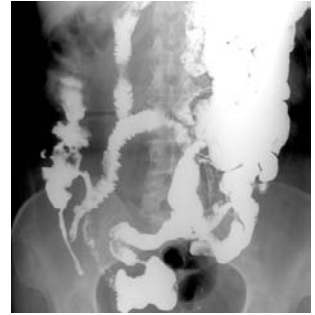
Turcot



SPICULATED SEROSA

SEARS Credit Card

Serosal mets
Endometriosis
Abscess/Adhesion
Radiation
Swallowed foreign body
Crohn's
Carcinoid



PNEUMATOSIS

CHIPS

COPD
Ischemia
Pneumatosis cystoides intestinalis
Scleroderma/Steroids



SACCULATIONS

MISC

Mets
Ischemia
Scleroderma
Crohn's



BALD COLON

I Use Radioactive Laxatives

Ischemia
Ulcerative colitis
Radiation
Laxatives
Scleroderma



GENERALIZED COLITIS

¹³¹I NR

Infectious-E. coli/CMV
Inflammatory-Pseudom, Crohn's/UC
Ischemic -A. fib etc.
Neoplastic-lymphoma
Radiation



FOCAL COLITIS

CECUM-

ABC

Amebiasis
Blastomycosis
CMV



RIGHT COLON-

Typhlitis, salmonella, shigella, TB, Diverticular bleed

TRANSVERSE-

Pseudomembranous/CMV/E. coli
Pancreatitis/Stomach

LEFT COLON-

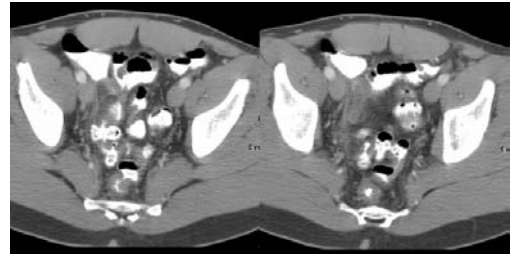
Diverticulitis/CA
Ischemia at flexure
RCC



APPENDIX

INC

- Infection
- Neoplasm
 - Cystadenocarcinoma
 - Mucocele
- Carcinoid



RECTUM

CLOGGED

- Chlamydia
- Lymphogranulomatous venerum
- Gonococcus



Liver

IN GENERAL:

1. Fatty or not? Always a favorite question



2. Cirrhotic or not? Makes one think of HCC every time



3. Portal vein—open or not? Consider HCC



DIFFUSE**FOCAL*****Neoplasm***

- HCC
- Cholangiocarcinoma
- Lymphoma

Neoplasm**“LIVER CELL”**

- Benign
 - Adenoma
 - FNH
- Malignant
 - HCC
 - Fibrolamellar
 - Metastasis

“BILE CELL”

- Benign
 - Cystadenoma
- Malignant
 - Cystadenocarcinoma

“MESENCHYMAL”

- Benign
 - Hemangioma
- Malignant
 - Lymphoma

***Infectious***

- Hepatitis

Infectious

- Abscess

Inflammatory

- Cirrhosis

Other

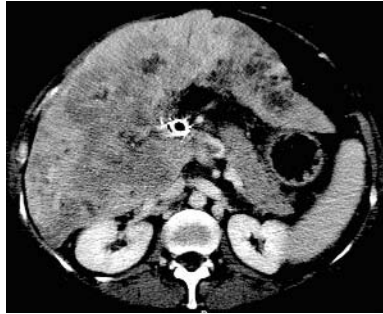
- Glycogen storage
- Hemochromatosis
- Fatty

Vascular

- Pre-Sinusoidal
 - Schistosomiasis
 - Cirrhosis
- Post Sinusoidal
 - Budd Chiari
 - CHF

IMAGES

Diffuse
Neoplasm
HCC



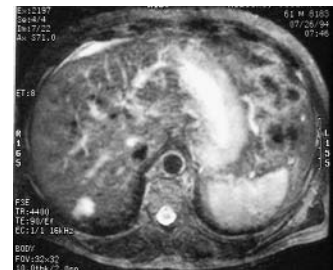
Focal
Neoplasm
"Liver cell"



Focal
Neoplasm
"Bile cell"



Focal
Neoplasm
"Mesenchymal"



Diffuse
Infectious



Focal
Infectious



Diffuse
Inflammatory



Diffuse
Other



Diffuse
Vascular



BILE DUCT DILITATION

High

HIV
PSC
Cholangiocarcinoma

Confluence

Metastatic lymph nodes
Klatskin
HCC
GB



Low

GB
Mirizzi
Post-instrumentation stricture
HCC

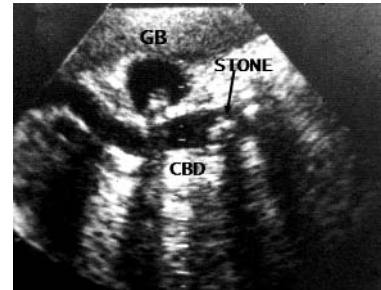


Ampulla

Panc CA



Stone



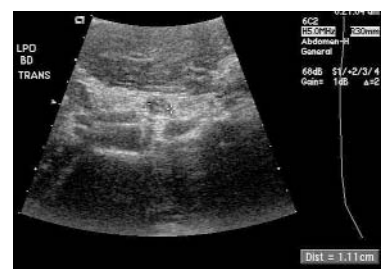
Cholangiocarcinoma



BILE DUCT WALL THICKENING

PAC-SAC

- Pancreatitis
- Ascending cholangitis
- Cholangiocarcinoma
- Sclerosing cholangitis
- AIDS cholangiopathy
- Choledocholithiasis



Pancreas

MASS

NEOPLASM

Gland

AISLE

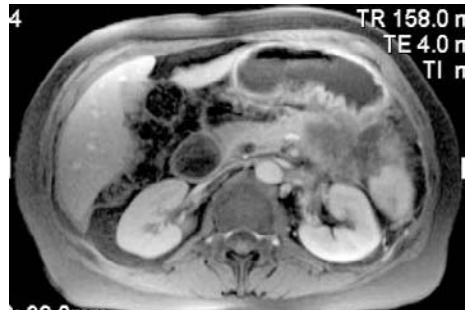
Adenocarcinoma

Islet

Solid and papillary epithelial neoplasm

Lymphoma

MEts

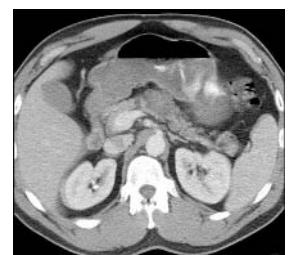


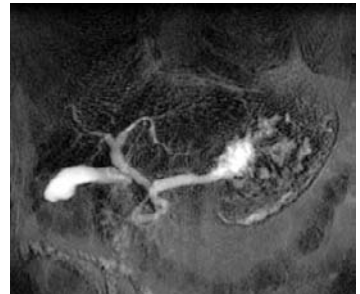
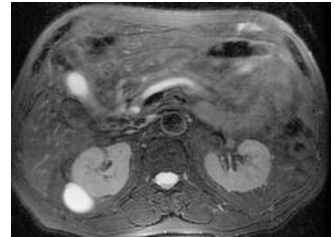
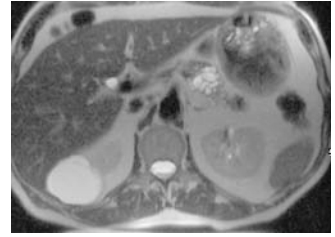
Duct

Macrocystic

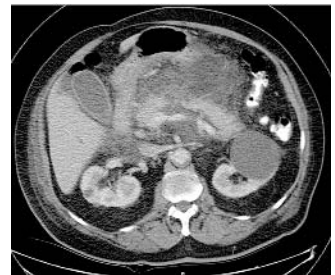
Microcystic

IPMT (intraductal papillary mucinous tumor of the pancreas)



Duct (continued)***INFLAMMATORY*****PANCREATITIS**

Focal

**OTHER**

Abscess

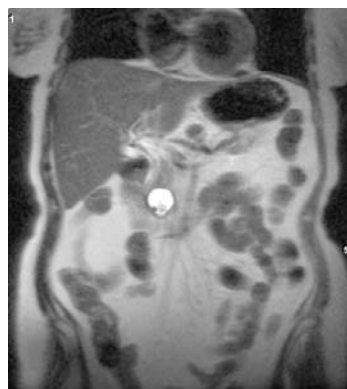
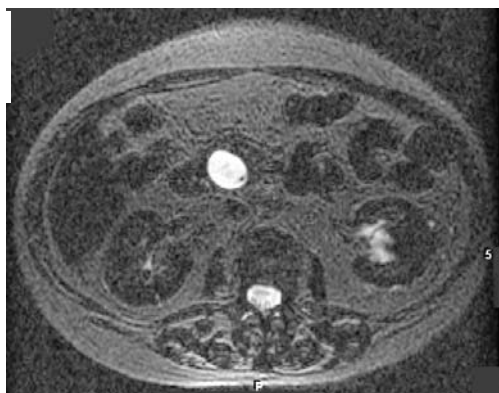
Pseudocyst



Real Cyst-VHL, PCKD



Choledochal cyst



Spleen

CYSTIC LESION

MATE

Metastasis
Abscess
Traumatic Cyst/Congenital Cyst
Echinococcal



SOLID LESION

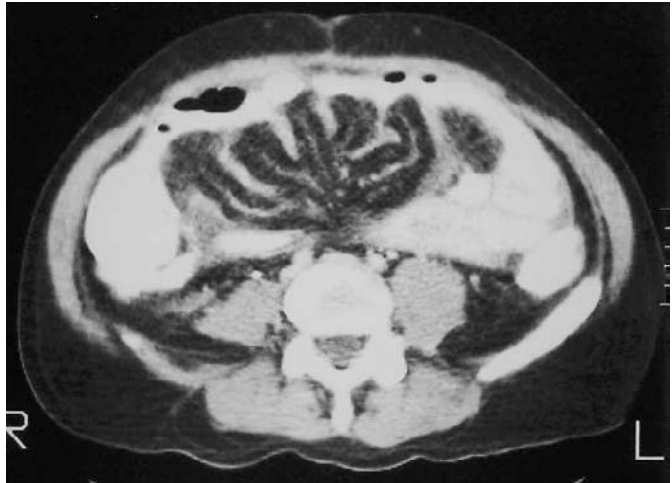
Granulomatous disease
Metastasis: melanoma
Hemangioma/sarcoma
Infarct



Peritoneal Masses

PEPPERCORN MELT

Peritoneal Carcinomatosis
Mesothelioma
Lymphoma
TB



4

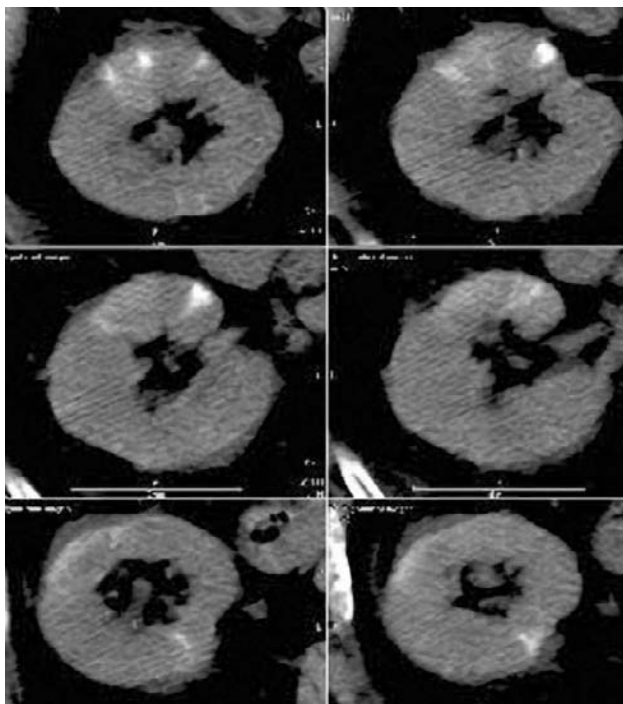
Genitourinary Radiology

NEPHROCALCINOSIS

Cortical

COAGS

Cortical necrosis
Oxalosis
Alports
Glomerulonephritis
Sickle cell disease



From: *Radiology: The Oral Boards Primer*
By: A. Mehta and D. P. Beall © Humana Press Inc., Totowa, NJ

Medullary**MARCH**

Medullary Sponge Kidney

Alkali

RTA

Cushing's syndrome

HPTH



PAPILLARY NECROSIS

NSAID

NSAID

Sickle cell

Analgesic

Infection TB/Pyelo

Diabetes

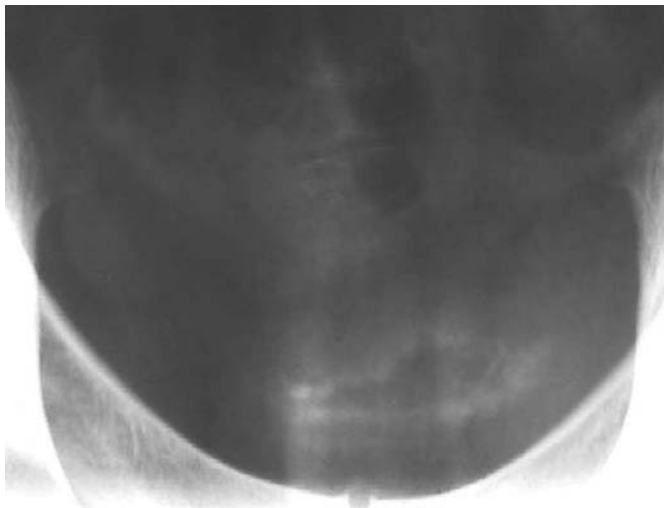


NSAID (continued)

BLADDER WALL CALCIFICATION

STIR

Schisto
Tb/TCC
Interstitial
or eosinophilic cystitis
Radiation



URETERAL STRICTURE

MISTER

Mets
Inflammation (stone)
Schisto
Tb/TCC/Trauma
Endometriosis
Radiation



URETERAL DEVIATION

TAP YOUR FRIEND ON THE SHOULDER

Lateral

TAP

- Tumor (retroperitoneal)
- Aneurysm/adenopathy
- Peritonealization of ureters/post op

Medial

FRIEND

- Fibroid
- RPF
- Idiopathic
- Enlarged prostate
- Node dissection
- Diverticulum



RENAL MASS (CATEGORIZE BY ENTITY OR SHAPE)**BY ENTITY*****Tumor*****CYSTIC**

Cystic RCC

MLCN

Mets

SOLID

Parenchymal—RCC

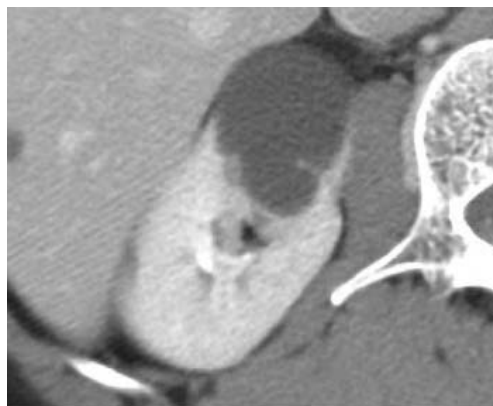
Mesenchymal—AML

Collecting System—TCC

OTHER

Mets

Lymphoma

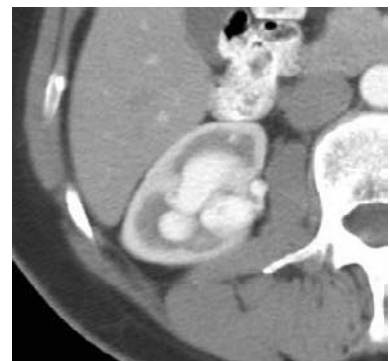
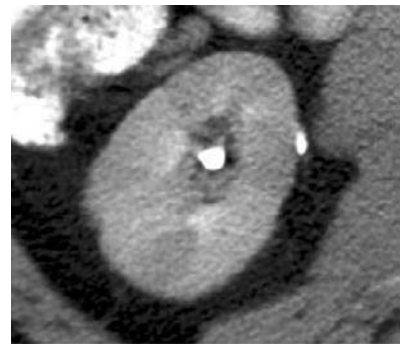
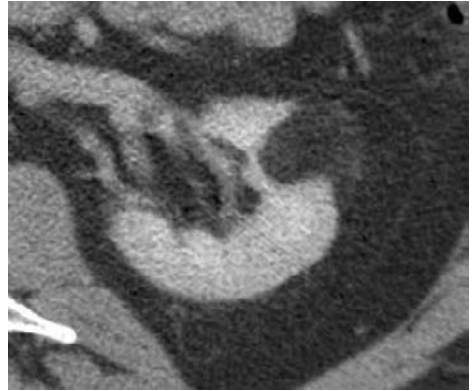


Infection

Abscess
Pyelonephritis
XGP focal or diffuse

Vascular

AVM
Hematoma

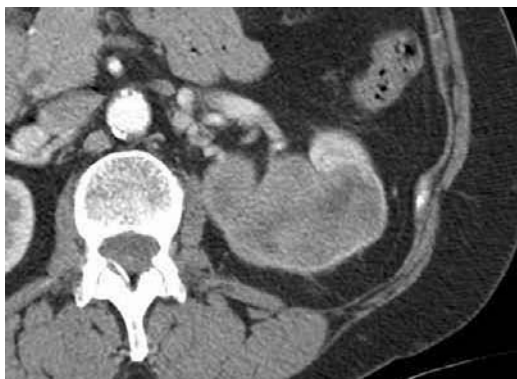


BY SHAPE***Bean-shaped (entire kidney)***

Metastasis
Diffuse RCC or TCC
Lymphoma
Infarction

Ball-shaped (single mass)

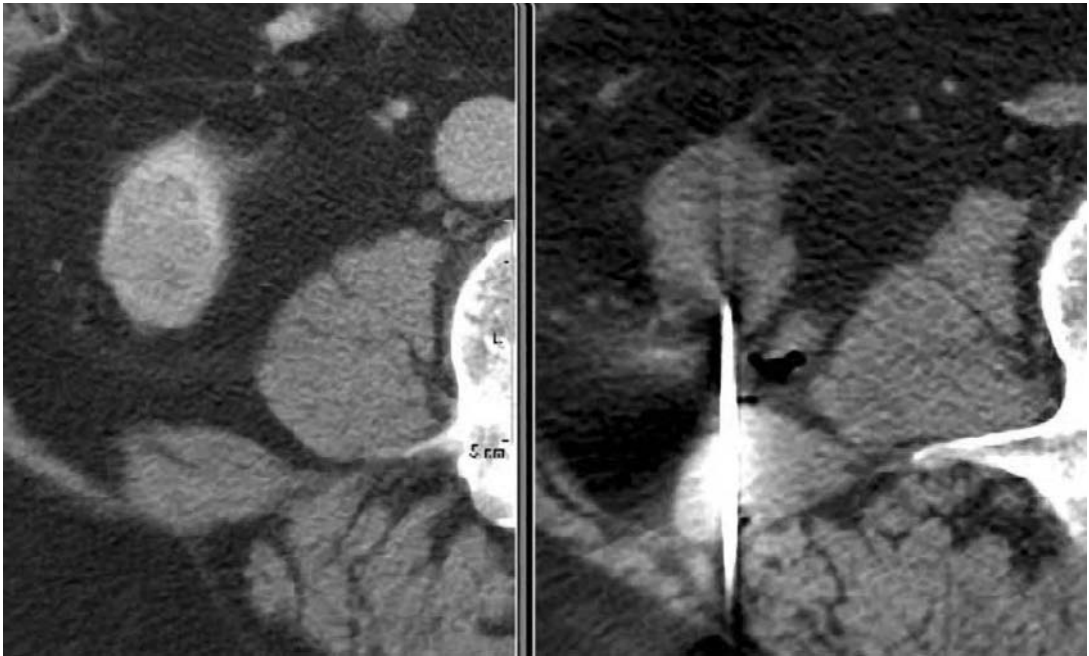
RCC
TCC
Metastasis
Infection



WHEN DO YOU BIOPSY?

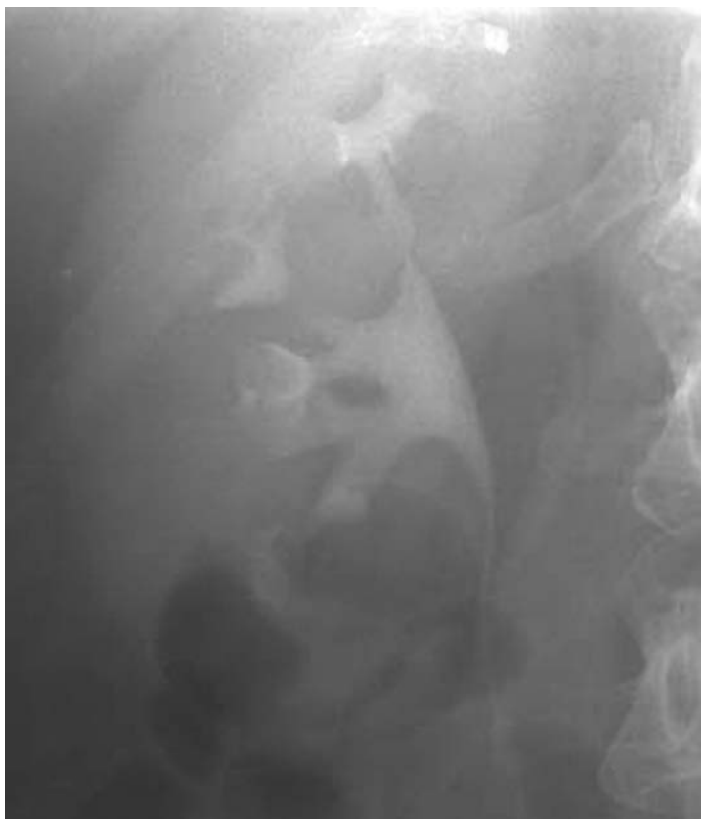
When it changes management

- ? Metastatic disease
- ? Lymphoma (medical vs sx treatment)
Single kidney
- ? Abscess



INFUNDIBULAR NARROWING

Inflammatory	—	Stone
Infection	—	TB — “Phantom calyx”
Instrumentation	—	Trauma
TCC	—	“Oncocalyx”



URETERAL DILATATION

PRESSURE OVERLOAD

Obstruction

VOLUME OVERLOAD

Reflux

Diuresis

INTRINSIC ABNORMALITY

Eagle Barrett

1° Megaureter



DELAYED NEPHROGRAM

PRERENAL

Hypotension
RAS

RENAL

Glomerulonephritis
ATN
Papillary necrosis

POSTRENAL

Crystals/proteins
Obstruction—ureteral or venous



STRIATED NEPHROGRAM

MOP

Medullary sponge
Obstruction—vascular or ureteral
(stone)
Pyelonephritis



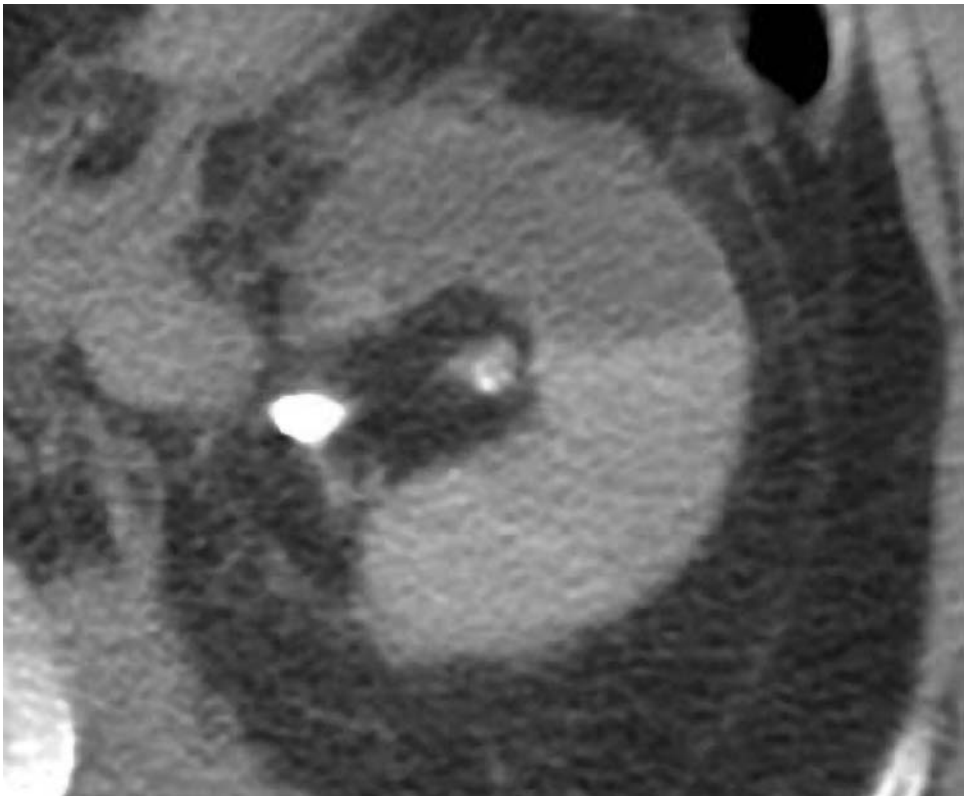
RIM SIGN

RAM

Renal vein thrombosis

ATN

Main renal artery thrombus/avulsion



UNILATERAL SMALL KIDNEY

Renal artery stenosis
Reflux nephropathy
Nephritis (chronic)
Congenital

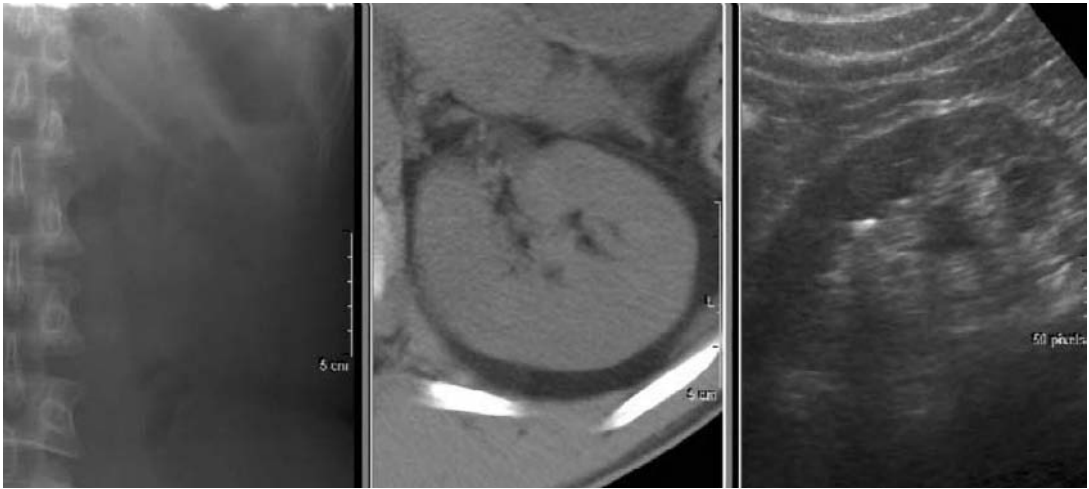
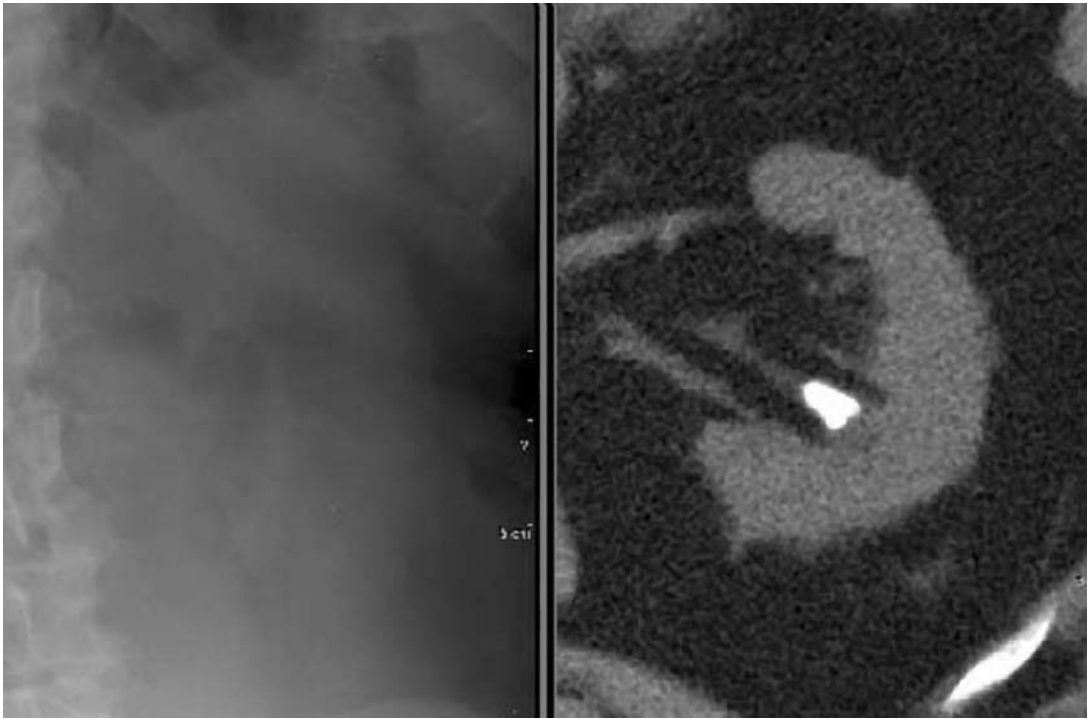


RENAL AND URETERAL STONES

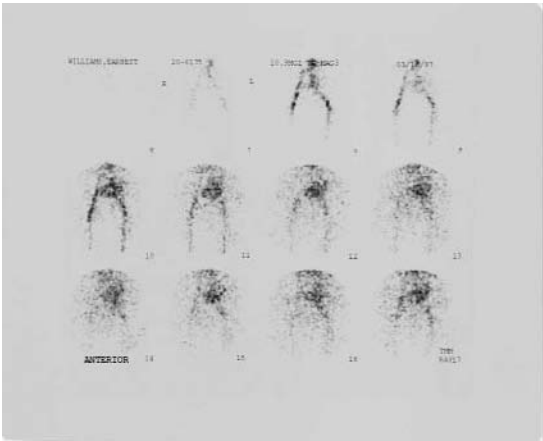
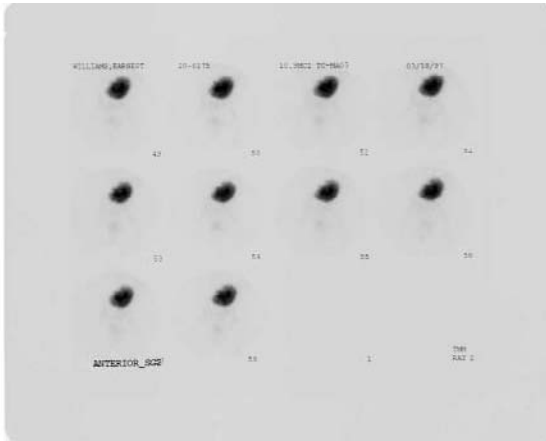
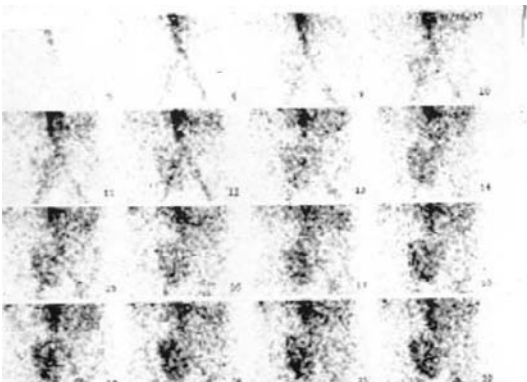
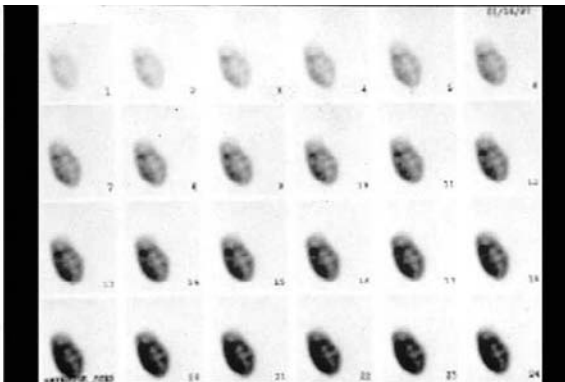
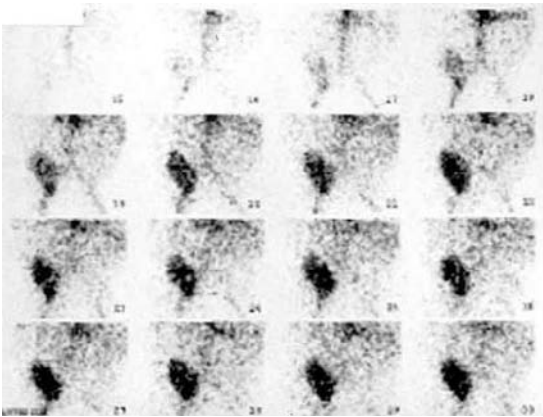
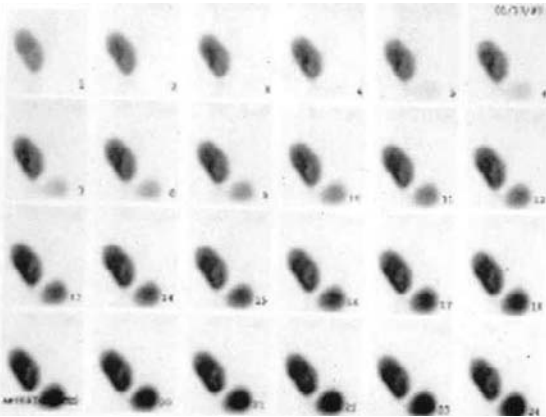
(Radio-opaque + / Radiolucent -)

	<i>Plain film</i>	<i>CT</i>
Calcium oxalate	+	+
SMUX		
Struvite		
Matrix	-	+
Uric acid		
Xanthine		
Indinavir	-	-





RENAL TRANSPLANT

	Flow	FCN
ATN	Normal	Decreased <24 h
		
Rejection	Decreased	Decreased
		
Cyclosporine	Normal	Decreased >24 h
		

URETERAL FILLING DEFECTS

Single

5CS

- Calcium (stones)
- Cancer (TCC)
- Clots (blood)
- Candida (fungus ball)
- Crazy papilla (papillary necrosis)

Multiple

SLUMM

- Stones
- Leukoplakia
- Ureteritis cystica
- Malakoplakia
- Metastasis — Melanoma



PEAR-SHAPED BLADDER

LAUNCH

Lipomatosis
Adenopathy/lymphoma
Urinoma
Neurofibromatosis
Caval obstruction (collaterals)
Hematoma (trauma)



Adrenal

MASS

CORTICAL

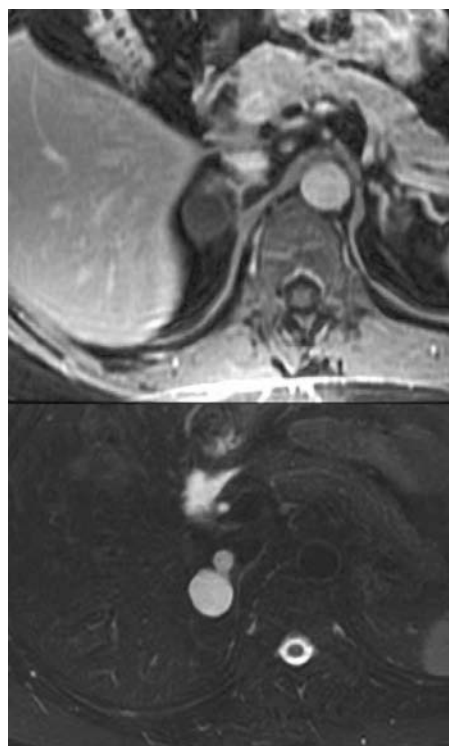
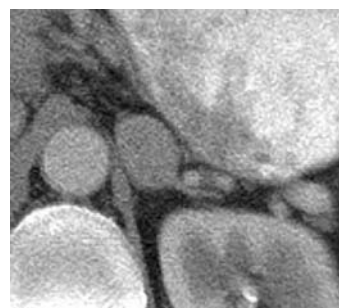
Adenoma
Carcinoma
Metastasis

MEDULLARY

Pheochromocytoma (5 Ps)
–pain
–pallor
–palpitations
–perspiration
–panic

CYSTS

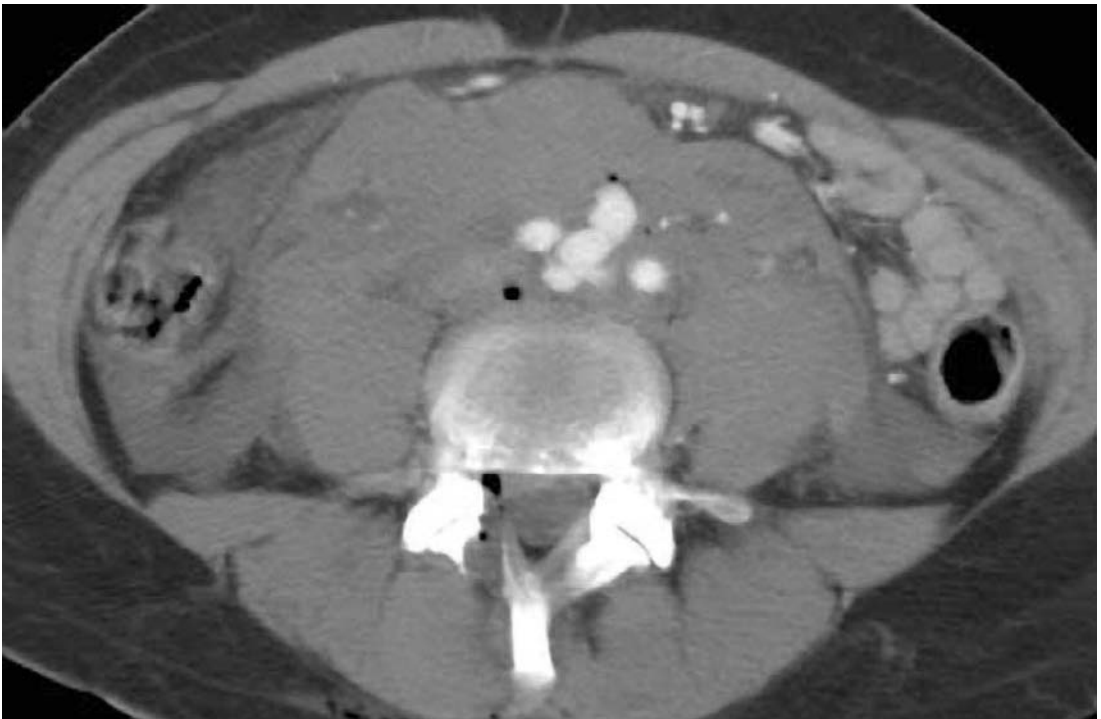
True—congenital
Pseudo—posthemorrhagic
Infectious—echinococcal



Retroperitoneum

NORMAL TO HEMORRHAGE

Neural (schwannoma, NF)
Ormond's disease (idiopathic RPF)
RPFibrosis (secondary — drug/tumor)
Metastasis from genital system
Adenopathy — infectious
Lymphoma
Hemorrhage



URETHRAL STRICTURE

I³

Infection

Gonorrhea

TB

Schistosomiasis

Iatrogenic

Injury — posttraumatic



Uterus

HSG

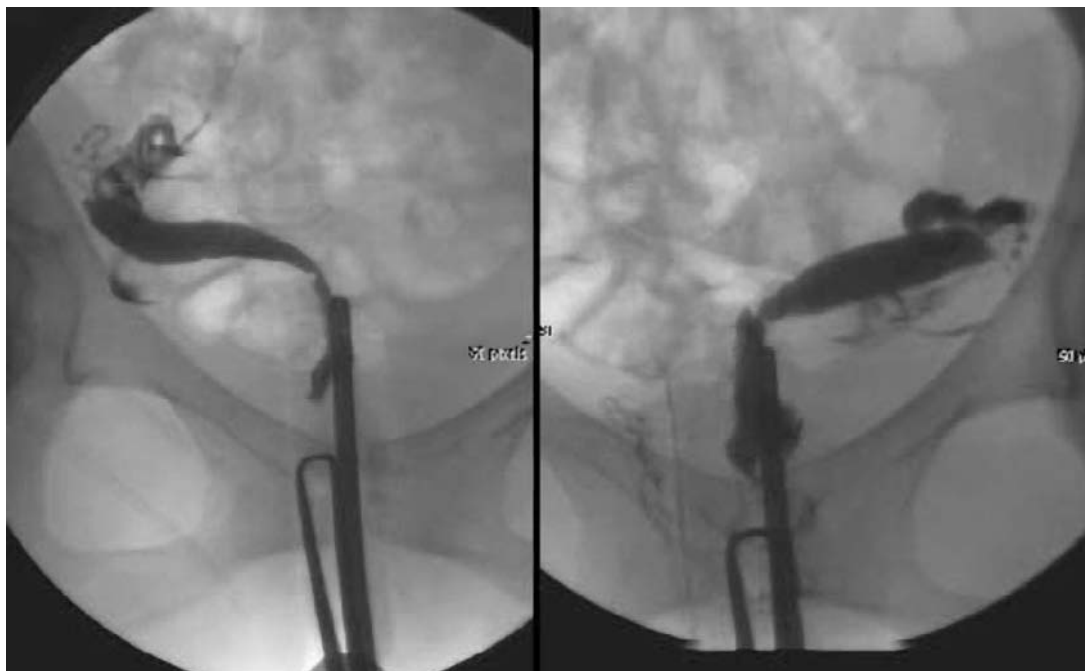
Can be shown essentially two types of cases with abnormalities:
Uterus or Fallopian tube

Uterine Cavity

Bicornuate vs Septate



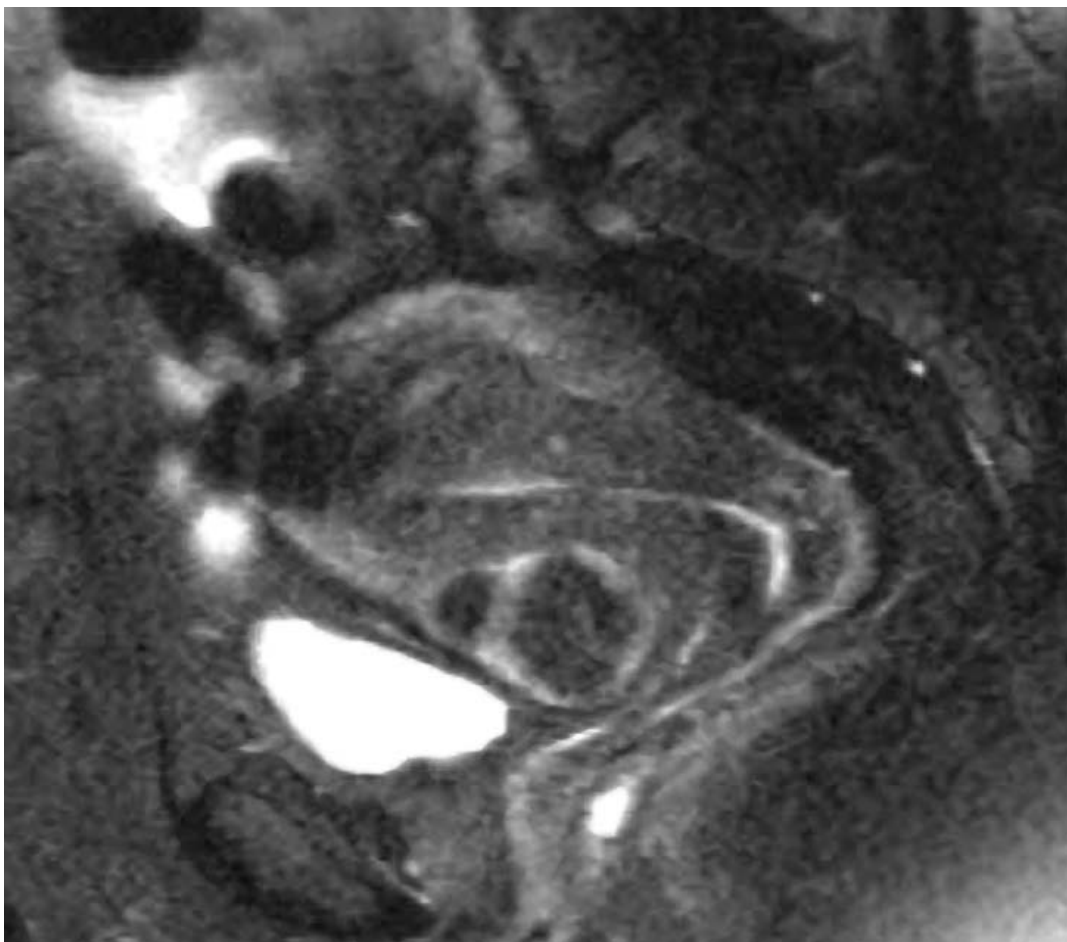
Didelphys



DES



Asherman's Syndrome
Adenomyosis

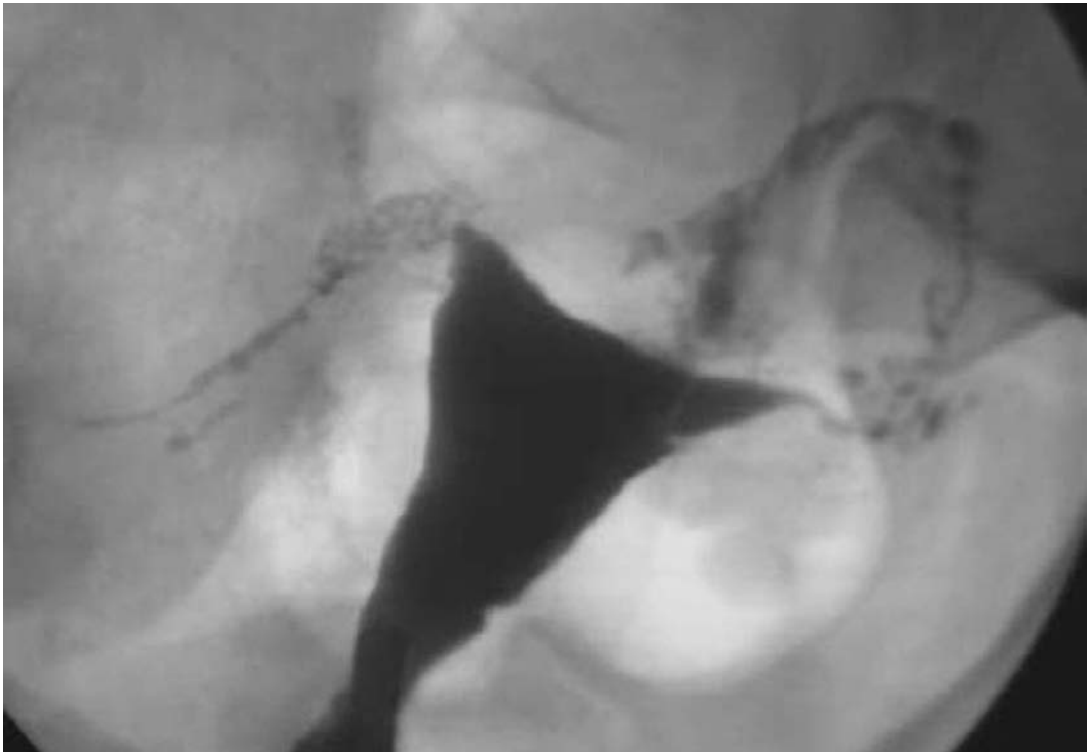


Fallopian Tube

Salpingitis Isthmica Nodosa

TB

Obstruction



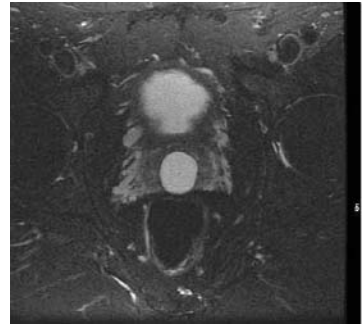
Prostate

CYSTS

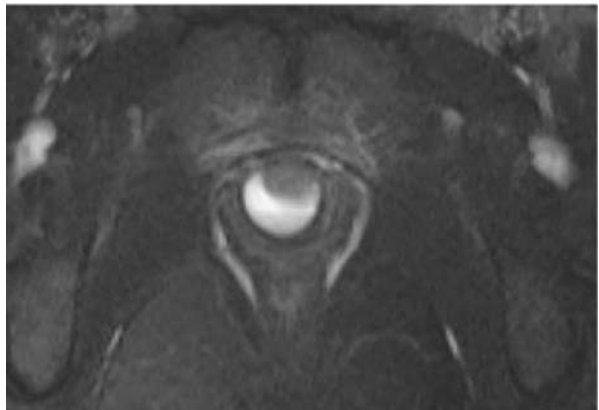
Midline

“U” CYST

Utricle



Urethra (connected)



Urethral polyp association

Undescended testicle association

“S” CYST

Mullerian

Sperm containing

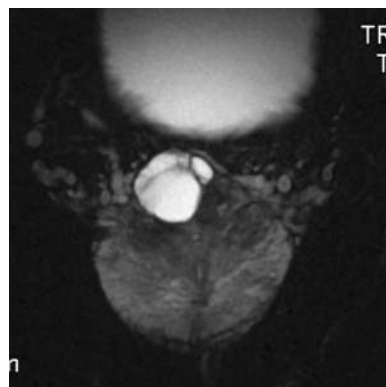
Stone forming

Superior extending (above prostate)

Paramedian

BPH

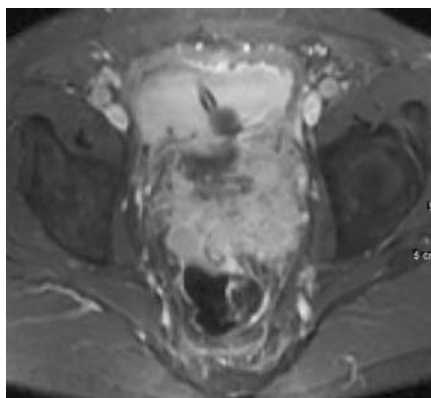
Ejaculatory duct cyst

***Lateral***

Seminal vesicle cyst (renal agenesis association)

***Infection******Neoplasm***

Peripheral zone (prostate carcinoma)



5

Head and Neck Radiology

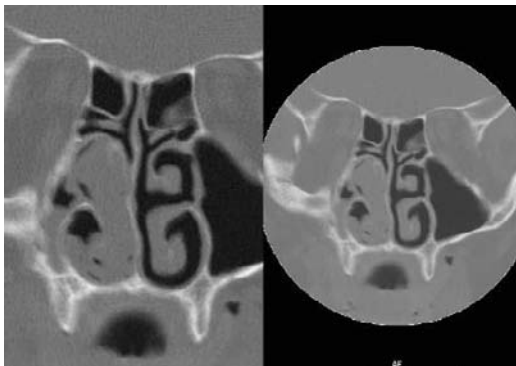
Includes plain film diagnosis of the skull, sinuses, mastoids, spine & head & neck structures and all other imaging and special procedures related to the central nervous system head & neck. This includes angiography, myelography, interventional techniques, CT, and MRI.

Sinuses

NASOPHARYNGEAL MASS

AISLE

- Antrochoanal polyp
- Inverted papilloma (destroys bone)
- Lethal midline granuloma
- Squamous cell carcinoma (destroys bone)
- Esthesioneuroblastoma (destroys bone)



SINUS MASS

AFIP

- Antrochoanal polyp
- Atelectatic sinus
- Fungal sinusitis
- Inverted papilloma
- Polyposis



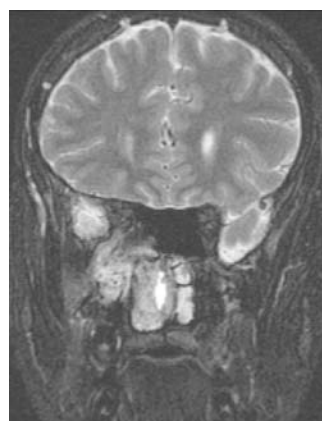
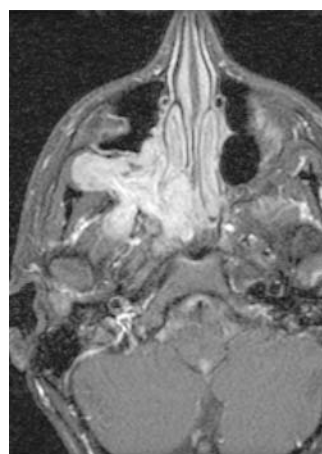
Head & Neck Spaces

PTERYOPALATINE FOSSA

Juvenile angiofibroma

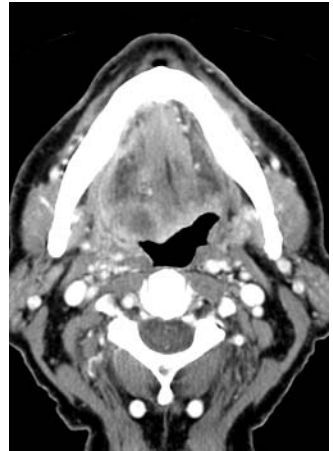
Schwannoma

Perineural spread from V2 (palate—mouth)—adenoid-cystic, melanoma, lymphoma



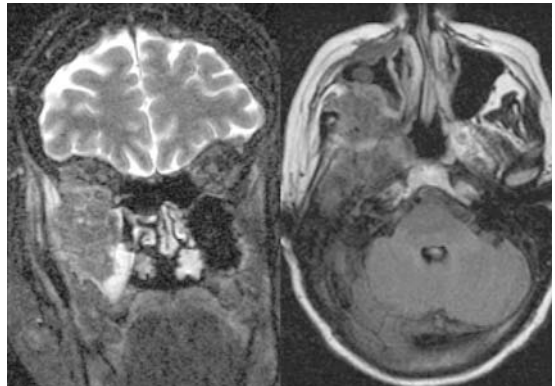
ORAL CAVITY/OROPHARYNX

Dermoid
Ranula
Hemangioma
SCC
Minor salivary



MASTICATOR SPACE

Bone—Odontogenic abscess
LN—Lymphoma
Muscle—Sarcoma
Nerve—V3 Schwan/NF
Mucosa—SCC



PAROTID SPACE/PRE STYLOID PARAPHARYNGEAL SPACE

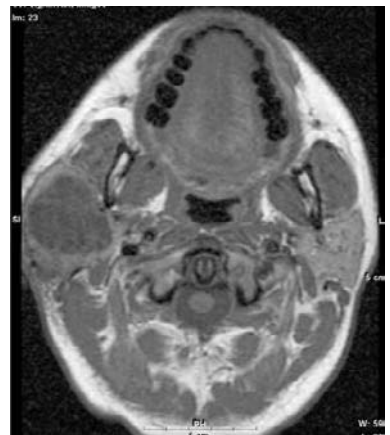
PLEASE WATCH OUT for HEMANGIOMAS

Benign:

Pleomorphic adenoma
Warthins
Oncocytoma
Hemangioma

Malignant:

Minor salivary gland tumors



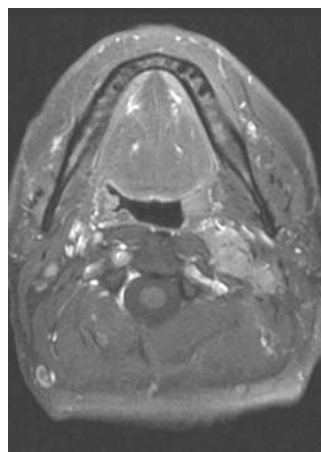
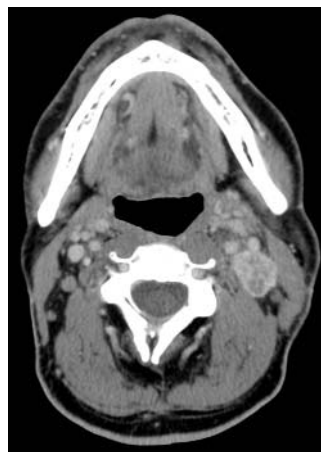
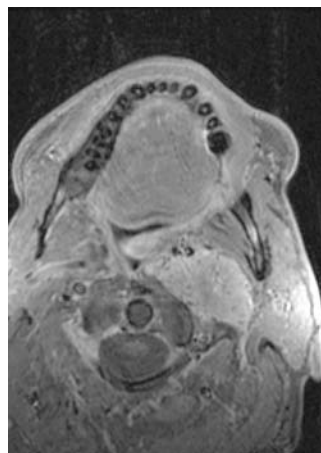
CAROTID SPACE

V—Carotid body tumor

N—Schwannoma/NF

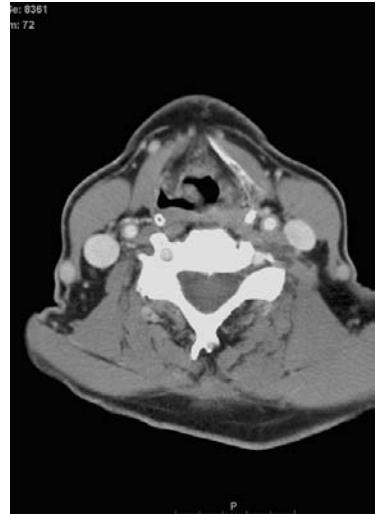
LN—Mets

M—SCC



PHARYNX

Laryngocele



CYSTIC NECK MASS

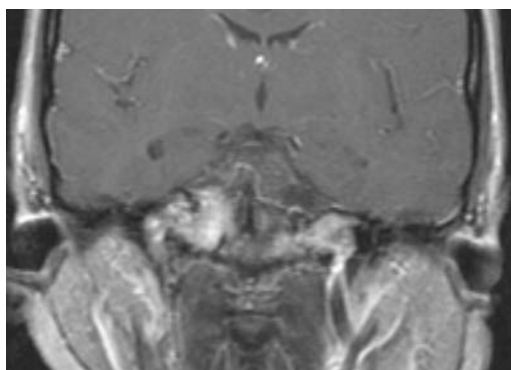
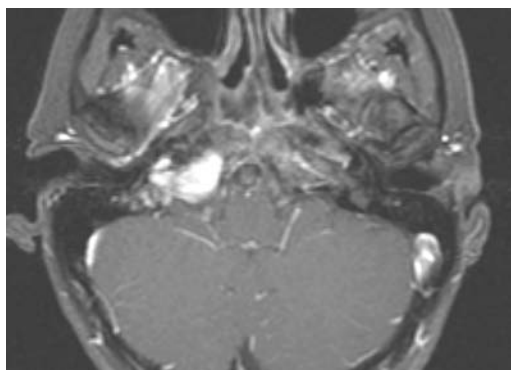
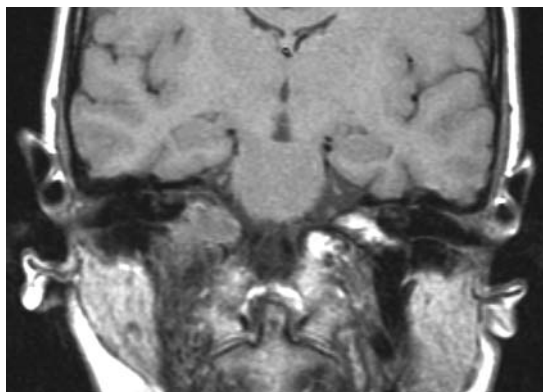
Second brachial cleft (fat)
Thyroglossal duct (medial)
Cystic hygroma (everywhere)
Laryngocele (pharynx)
Abscess (retropharyngeal space)
Necrotic nodes



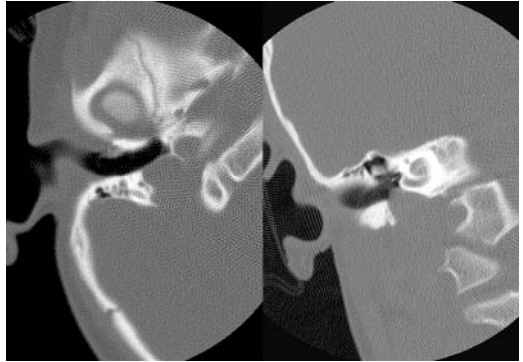
Other

PULSATILE TINNITUS

Glomus tumor



Dehiscent jugular vein (bulb)



Aberrant carotid
AVM

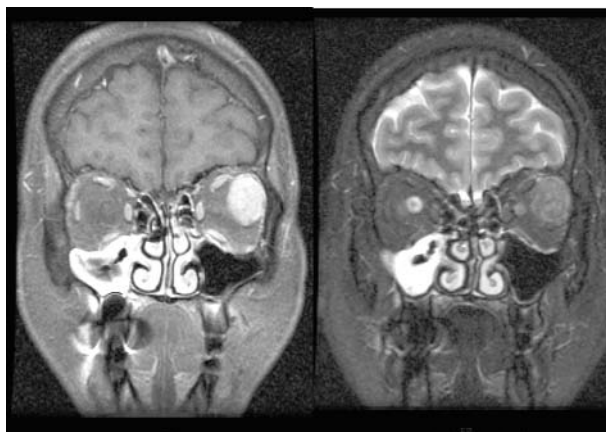


Orbit

LACRIMAL GLAND

MELDS

- Metastasis
- Epithelial tumor—pleomorphic
adenoma/carcinoma
- Lymphoma
- Dermoid
- Sjogrens/Sarcoid



EXTRACONAL**LIMP + RHABDO**

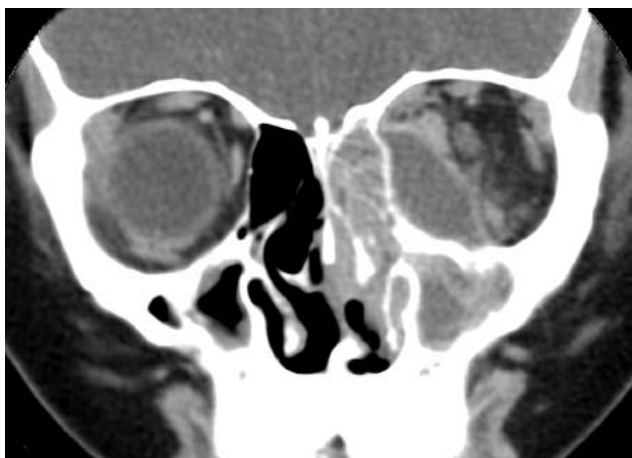
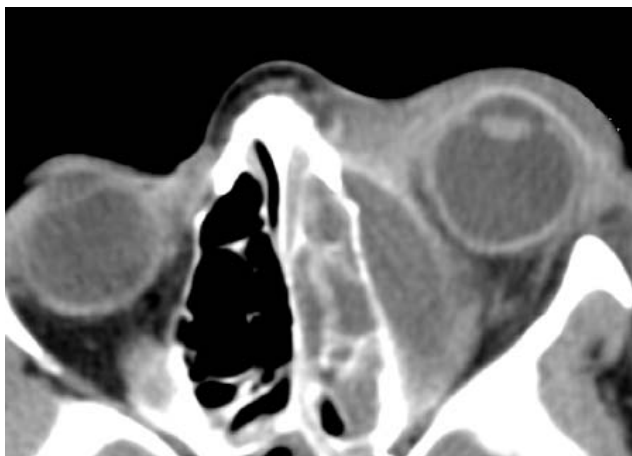
Lymphoma

Infection

Mets

Pseudotumor

Rhabdomyosarcoma



INTRACONAL

LIMP + HEMANGIOMA

Lymphoma

Infection

Mets

Pseudotumor

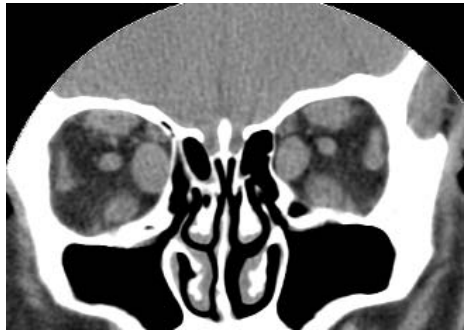
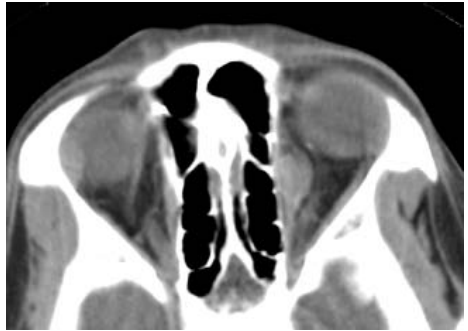
Hemangioma



EXTRAOCULAR MUSCLES

LIMP + GRAVES

Lymphoma
Infection
Metastasis
Pseudotumor
Graves



OPTIC NERVE

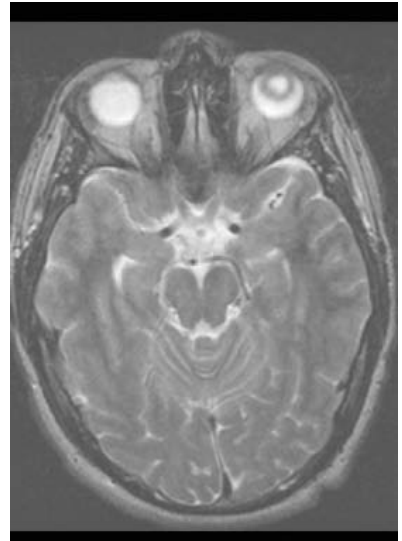
LIMP + GMN

Lymphoma
Infection
Metastasis
Pseudotumor
Glioma
Meningioma
Neuritis



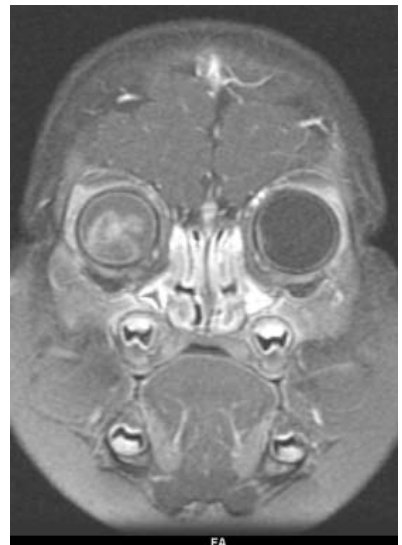
GLOBE

- Mets
- Melanoma
- Drusen



LEUKOCORIA

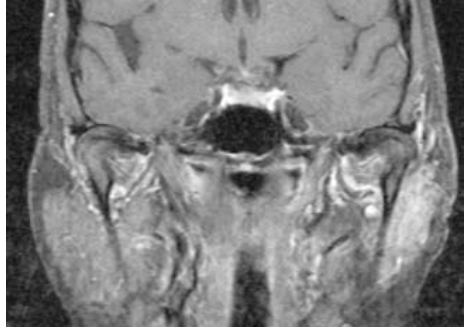
- Retinoblastoma
- PHPV
- Coats
- RLF (retrolental fibroplasia)
- Phthisis bulbi



Angle of Mandible

ANTERIOR MASS

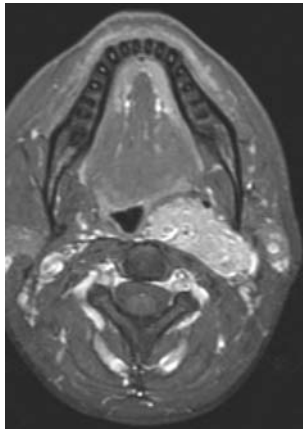
Submandibular gland mass
Sublingual gland mass
Larynx
Parotid



POSTERIOR MASS (LOOK AT CAROTID)

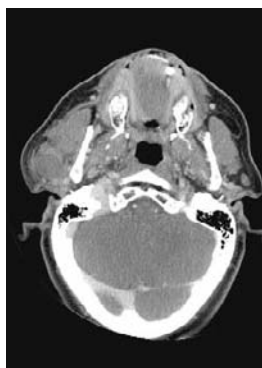
Splayed

Carotid body tumor



Lateral

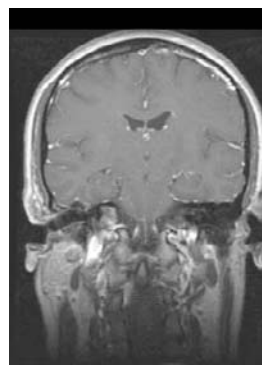
Brachial cleft cyst
Papillary thyroid CA
Cystic schwannoma
Cystic hygroma
Lymphoma/Node

***Posterior***

Node or Nerve

***Medial***

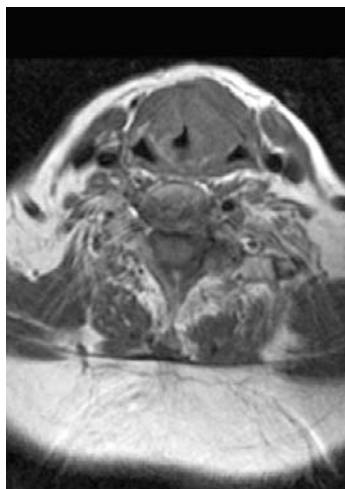
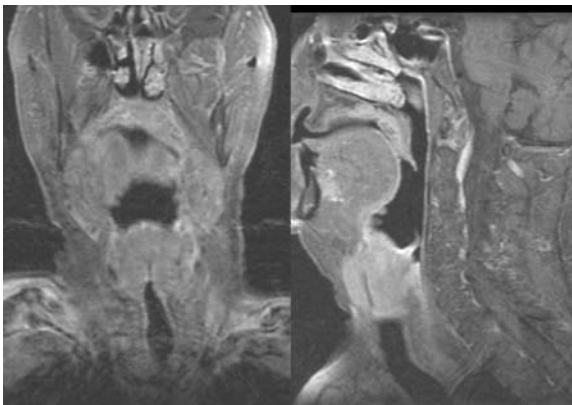
Nerve only



Neck

TUMOR

Glottic
Supraglottic (FAT)
Subglottic



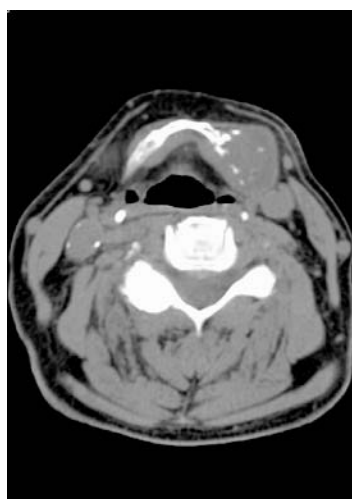
MIDLINE OR SOMEWHAT OFF MIDLINE

Cyst

Thyroglossal duct cyst

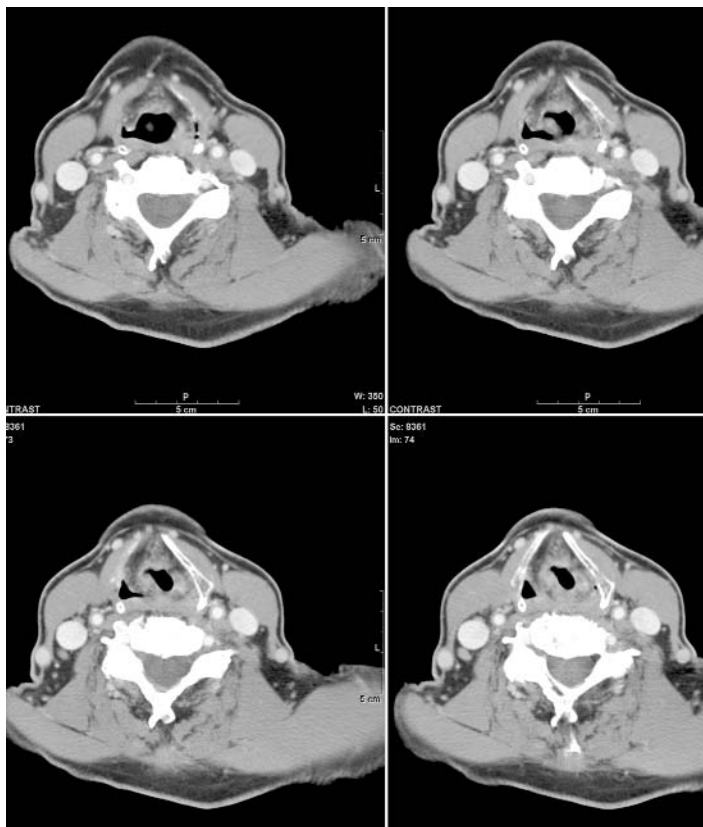
Bone

Chondrosarcoma



Submucosal

Laryngocele



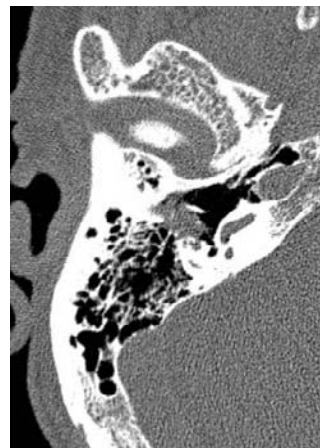
Temporal Bone

WHITE MASS

Cholesteatoma

- a. Tegmen tympani ? intact
- b. Lat wall semicircular canal ? intact
- c. Facial nerve—
Location? Bone? Relationships?

Cholesterol Granuloma



RED MASS

Glomus Jugulare

- Erodes pars vascularis
- do angio to determine vs hemangioma

Glomus Tympanicum

- Jugular bulb ok
- no angio

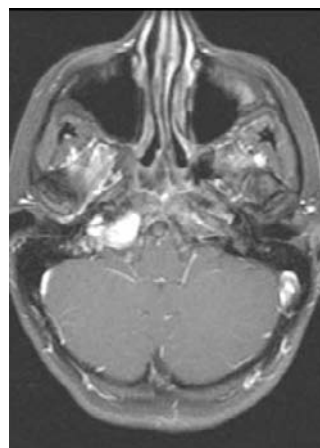
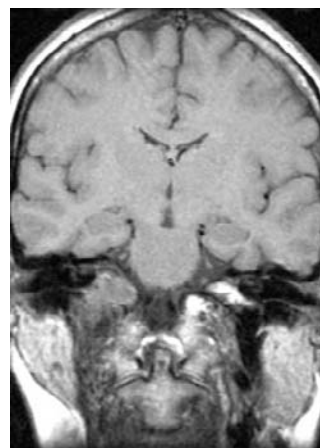
Aberrant Carotid

- Peristant stapedial artery

Jugular Bulb Anomalies

WORKUP

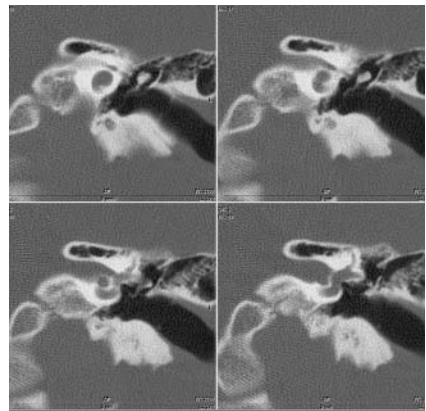
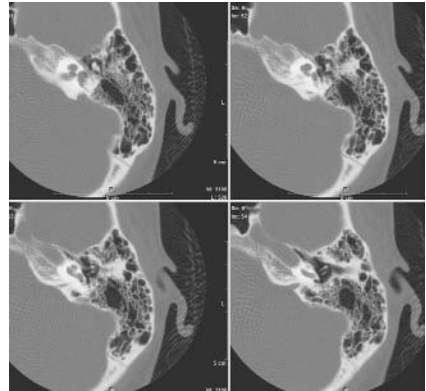
- CT separates aberrant carotid/GJ/GT
- MR for flow void assessment and extent



OTHER

MONDINI

- Inner ear
- Segmentation cochlear problem
- Interscalar septum
- Lateral semicircular canal (central post absent)
- Vestibular aqueduct—bigger than posterior semicircular canal

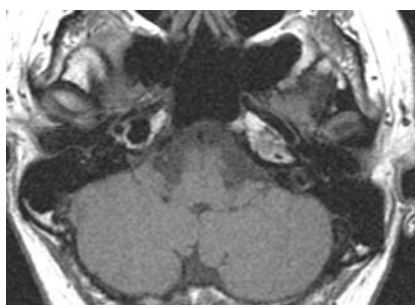
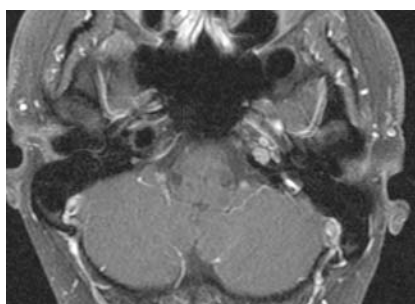


PETROUS EXPANSION

Cholesterol cyst/granuloma T1 BRIGHT

Epidermoid/cholesteatoma T1 DARK

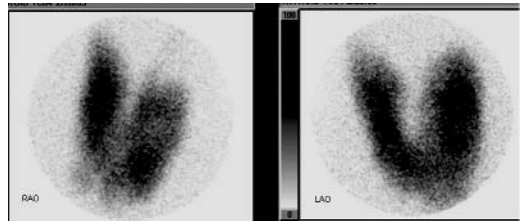
Mucocele



Thyroid

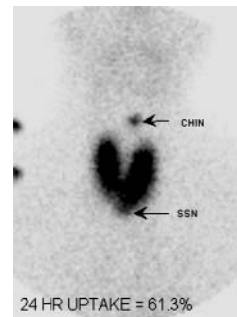
SUBACUTE

Post-viral
Hypothyroid
Fever, chills, pain

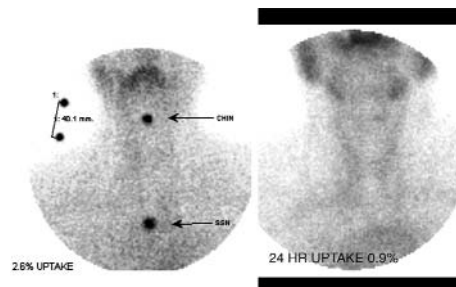


HASHIMOTO'S

Early — Hyperthyroid



Late — Hypothyroid



GRAVES

Goiter
Thyrotoxicosis
Increased uptake — gland hot

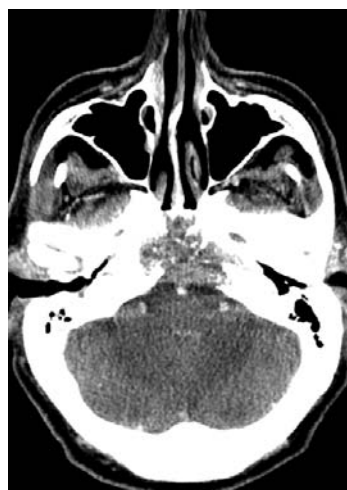
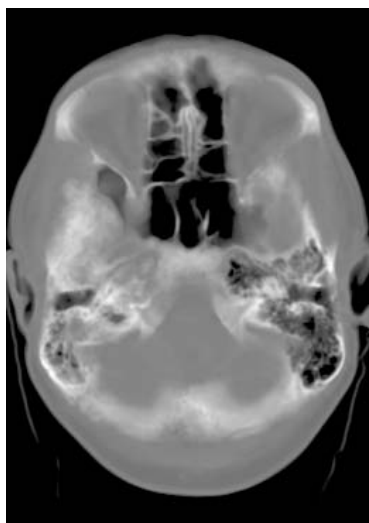


Skull Base

BY LOCATION

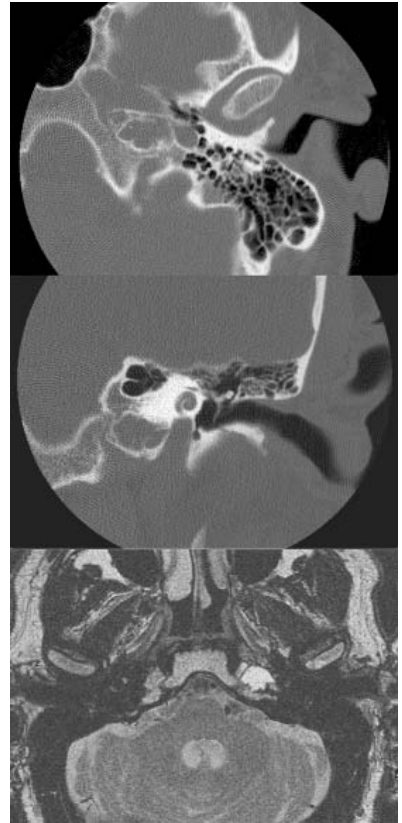
Midline

Craniopharyngioma
Chordoma



Paramedian

Carotid aneurysm
Chondrosarcoma

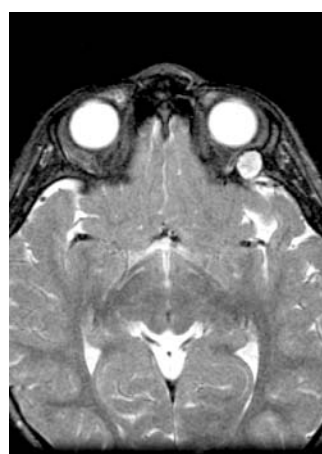
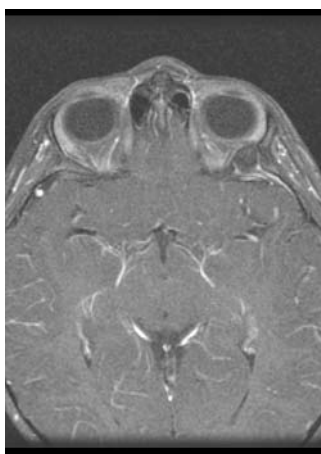
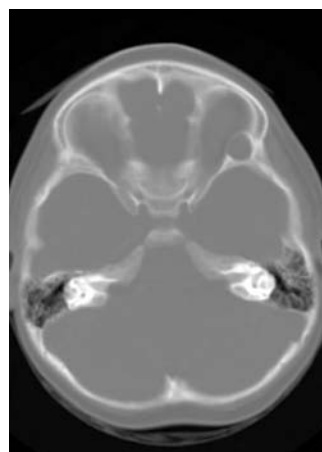
***Lateral (GW of sphenoid)***

Meningioma
Metastasis
Dermoid
Glomus
Epidermoid
Cholesterol cyst



Always Include

Mets
Myeloma
Lymphoma

**LACRIMAL**

Epithelial—Pleomorphic adenoma, Adenoid cystic, Mucoepidermoid

Lymphoid—Lymphoma, Sjogren, Benign lymphoid hyperplasia



6

Vascular and Interventional

Includes the diagnosis of all abnormalities and anomalies of the arteries, veins, and lymphatics. It includes all vascular and nonvascular imaging-directed interventional procedures. All modalities and techniques used in diagnostic and interventional procedures are also included.

GENERAL APPROACHES

1. Technique

- a. Which vessel injected
- b. Phase of injection
 - i. Arterial—early/mid/late
 - ii. Venous—early/mid/late

2. Anatomy

- a. Which vessels are opacified?
- b. Are the expected vessels based on the injection filled?
- c. Are any vessels missing?
- d. Are there vessels that should not be filling?
- e. Anatomy—too small/too large/filling defects/cutoff
- f. Are there vessels that are filling early?

TECHNIQUE SPECIFICS

VASCULAR

Injection and Filming Rates

Pulmonary artery	20 cc/s	for	40 cc	at	8 f/s
Thoracic aorta	25 cc/s	for	50 cc	at	8 f/s
Abdominal aorta	20 cc/s	for	40 cc	at	6 f/s
Pelvic aorta/bifurcation	10 cc/s	for	20 cc	at	2 f/s
Iliac artery	5 cc/s	for	10 cc	at	2 f/s
Celiac artery/SMA	5 cc/s	for	50 cc	at	2 f/s
Inferior mesenteric artery	3 cc/s	for	30 cc	at	2 f/s
Renal artery	4 cc/s	for	8 cc	at	4 f/s
Carotid artery	6 cc /s	for	10 cc	at	4 f/s
Subclavian artery	5 cc /s	for	10 cc	at	3 f/s
IVC	20 cc/s	for	30 cc	at	4 f/s

ANGIOPLASTY

CHOOSE

1. Diameter (usually 10% larger than the vessel)

- | | |
|---------------------|-------|
| a. Aorta | 20 mm |
| b. Common iliac | 8 mm |
| c. External iliac | 7 mm |
| d. SFA | 6 mm |
| e. Popliteal | 5 mm |
| f. Tibial | 3 mm |
| g. Dorsalis pedis | 2 mm |
| h. Renal/celiac/SMA | 6 mm |

2. Length

a. Most successful for SHORT, CONCENTRIC, NON-CALCIFIED

3. French size (for pressure measurement, sheath should be 2 FR >catheter)

4. Shaft length of balloon

5. Burst pressure of balloon

6. Gradients

a. Significant = >10 mmHg at rest, >20 mmHg after challenge
or >10% of systolic BP**EMBOLIZATION****EMBOLIC AGENTS*****Liquid***

- ETOH
- Glue

Particulate

- Gelfoam slurry
- Ivalon/PVA
- Clot
- Embolization spheres

Devices

- Coils
- Balloons

THROMBOLYSIS**AGENTS**

tPA (Alteplase) (arterial):

Infuse at 0.5–1 mg/h. Typically place 10 mg of tPA in 1000 cc of NS and infuse at 50 cc/h (0.5 mg/h). The mean time to lysis is about 20 h. The average total dose is 10–20 mg. The total dose to the patient should not exceed 40 mg.

tPA (venous):

Same infusion rate as arterial.

tPA (Alteplase) (line lysis):

Place 2 mg of tPA in 2 cc of NS and dwell in the lumen for 2 h then aspirate.

RPA (Retaplast):

Same as Alteplase but much more published experience with Alteplase.

Streptokinase:

Do not use due to anaphylactic reaction possibility.

Urokinase:

100,000 U/h divided between infusion catheters.

This agent, however, is

no longer being manufactured.

Heparin:

1000 U/h for target PTT for 60–80 s

Contraindications**ABSOLUTE**

Active internal bleeding
Irreversible limb ischemia
Recent stroke
Brain tumor
Left heart thrombus

RELATIVE

History of GI bleeding
Major surgery within 10 d
Diabetic hemorrhagic retinopathy
Coagulopathy
Embolus of cardiac source

UTILIZED MEDICATIONS**VASODILATORS**

Nitroglycerin—100 µg doses
Priscoline—25 mg doses
Papaverine—25 mg doses

VASOCONSTRICTORS

Vasopressin—0.1–0.4 µg

ANALGESICS/AMNESICS

Morphine—1 mg bolus, 1 mg maintenance
Versed (midazolam)—1 mg bolus, 1 mg maintenance
Fentanyl 50 µg bolus, 50 µg maintenance

ANTAGONISTS

Naloxone (opioid antagonist) 1 mg IV
Flumazenil (benzodiazepene antagonist) 0.2 mg IV

COMMONLY TESTED PROCEDURES***Vascular Intervention*****VENA CAVA FILTER**

1. Access femoral vein
2. Place pigtail catheter at iliac confluence and perform IVC gram to determine size of IVC and renal vein location
3. Exchange for wire and IVC filter sheath
4. Deploy filter
5. Re-perform IVC gram

TIPS

1. Right internal jugular vein approach with US guidance
2. Place small catheter into hepatic veins and perform venogram after obtaining wedge pressures
3. Using direct puncture, create a connection between the right hepatic vein and right portal vein and place a wire into the portal system
4. Dilate the tract with balloon angioplasty and deploy metallic stent
5. Determine post-procedure gradients and consider coiling varices

Nonvascular Intervention**BILIARY DRAINAGE**

1. Antibiotics
2. Right lateral midaxillary approach (RIGHT SYSTEM) or subxyphoid approach (LEFT SYSTEM)
3. Chiba needle or one stick system with slow injection and retraction of needle under fluoroscopy. Repeat until bile ducts visualized
4. Exchange for guidewire and plastic catheter with passage into duodenum
5. Dilate skin and place drain
6. Confirm position by fluoroscopy

CHOLECYSTOSTOMY

1. US guidance to determine pathway that is transhepatic to minimize bile leak
2. Use small spinal needle to access GB and in tandem insert 8 FR catheter
3. Aspirate for bile for culture and sensitivity
4. Left in until surgery or at least 3 wk to form tract

PERCUTANEOUS GASTROSTOMY

1. If ascites: Do paracentesis first
2. Indication dictates type of tube: feeding—GJ tube, drainage—G tube
3. Using US guidance, determine left edge of liver and spleen
4. Cup of barium from night before to outline colon through NG tube
5. Insufflate stomach
6. Gastropexy with T-tacks and retract the stomach to the abdominal wall in the high gastric body
7. Place needle between the 4 T-tacks with placement of a stiff wire into the stomach
8. Dilate skin and place peel-away sheath.
9. Place tube
10. T-tacks removed in 3–6 wk.

ABSCESS DRAINAGE

1. Two methods: TROCAR vs SELDINGER
2. Localize abscess under CT or US guidance.
3. TROCAR:
 - a. Access abscess with small spinal needle and aspirate pus for microbiology
 - b. Adjacent to spinal needle, in tandem, place catheter

4. SELDINGER:
 - a. Use one stick needle and place into abscess
 - b. Place wire through sheath
 - c. Dilate tract
 - d. Place drainage catheter
 - e. Aspirate abscess for microbiology

PERCUTANEOUS NEPHROSTOMY

1. In the prone position, locate the kidney under US guidance.
2. Place a small spinal or equivalent needle in the upper pole calyx
3. Infuse a small amount of dilute contrast
4. Using a second one stick system, access the middle pole calyx under fluoroscopic guidance
5. Place wire into collecting system
6. Dilate skin
7. Place PCN tube

GENERAL VASCULAR DIFFERENTIAL DIAGNOSIS

AV TIMER

Atherosclerosis

Vasculitis

a. Large vessel: GIANT/TAKAYASU

b. Medium vessel: BERGER/BEHCET

c. Small vessel: CTD–SCLERODERMA LUPUS

Trauma (Dissection)

Infection

Metabolic (Diabetes) or Meds (Ergots)

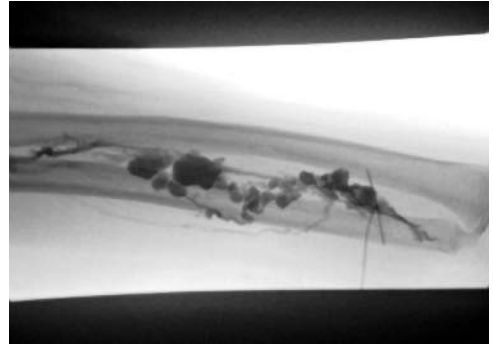
External (Tumor)

Radiation

TUMOR DESCRIPTORS

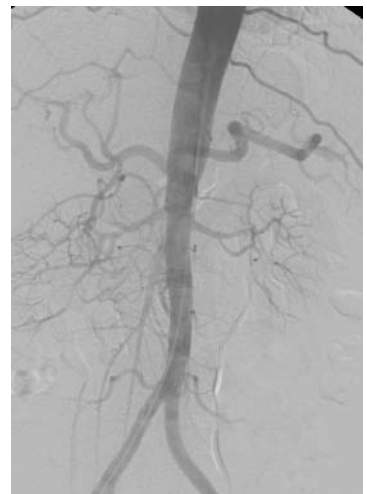
NAP IN BED

Neovascularity
AV shunting
Puddling
Blush
Encasement
Displacement of normal vessels



SMALL AORTA

Williams Syndrome
Takayasu (<40), giant cell arteritis (>40)
Small aorta syndrome (female) (smoker)
Dissection
Neurofibromatosis



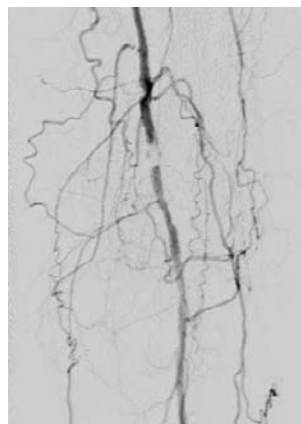
POPLITEAL ENTITIES

Intrinsic

Thrombus (popliteal aneurysm)

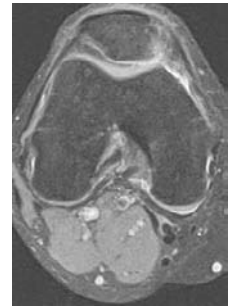
Embolus

Trauma

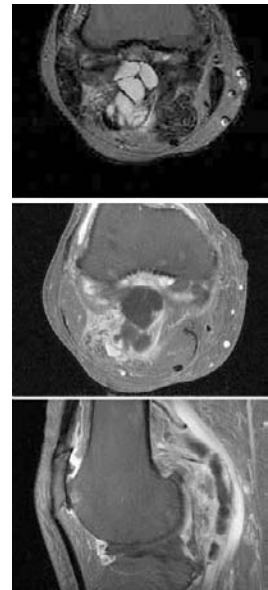


Extrinsic

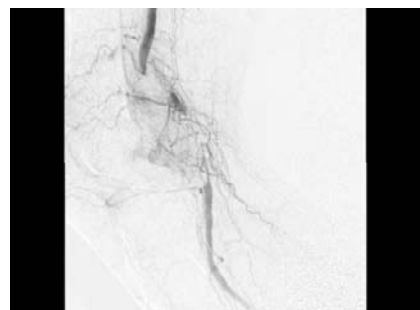
Popliteal entrapment syndrome



Cystic adventitial disease (MRI Dx)

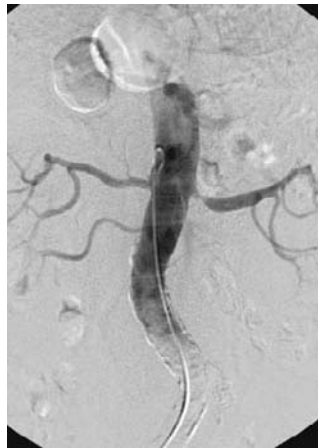


External tumor



RENAL***Aneurysms***

Polyarteritis nodosa
Lupus
Scleroderma
Wegeners
HIV
Drug-induced

***Artery***

Atherosclerosis
FMD (renal, ICA, illiac, viscerals)
NF
Arteritis
Radiation
Dissection



AORTIC ROOT

Aneurysm

Connective tissue disease (involves the root)

Atherosclerosis (look at the rest of the aorta)

Trauma

Vasculitis

Mycotic

Syphillis (Luetic)



HEMOPTYSIS

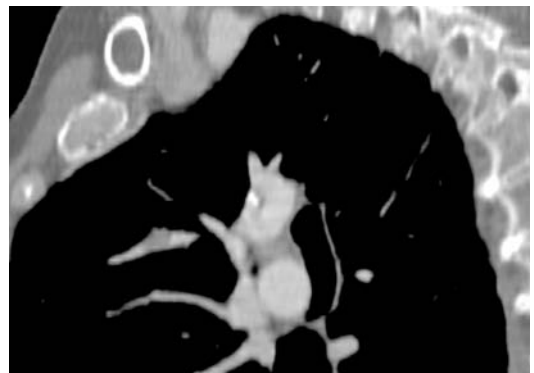
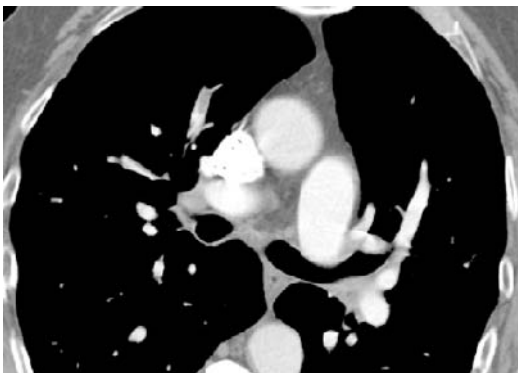
Bronchial

Check spinal artery in field
Cystic fibrosis
Bronchiectasis
TB
Aspergillus

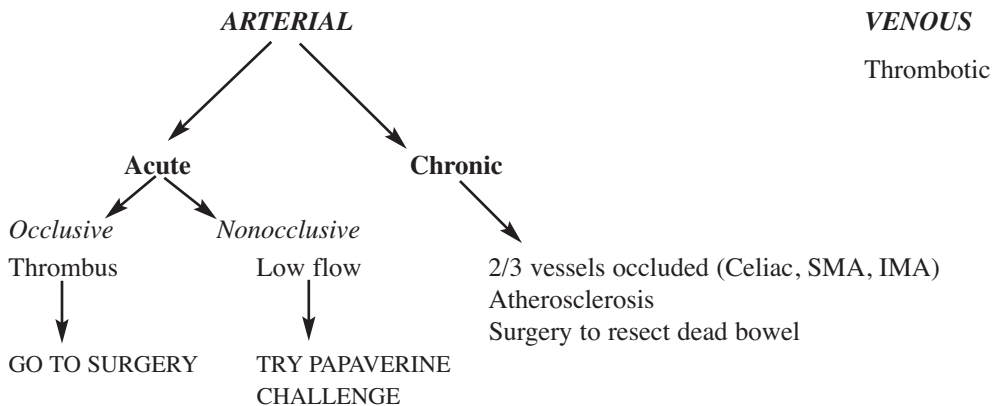


Pulmonary Artery

Pulmonary embolus
Infarction

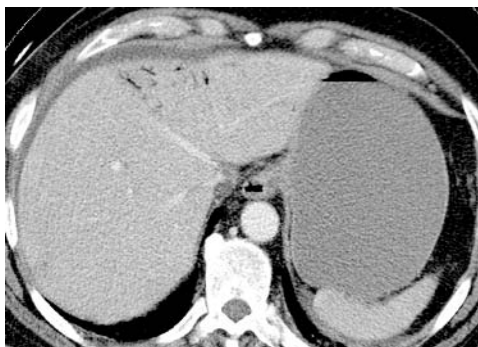


MESENTERIC ISCHEMIA



ENDPOINTS

Ischemia to bleeding
Decompensates—peritoneal signs
Improve and wean
Heparin drip with thrombolysis



GI BLEEDING

UGI (Proximal To Ligament of Treitz)

ARTERIAL	VENOUS
Gastritis Peptic Ulcer Pseudoaneurysm	Varices Mallory Tear
↓	↓
VASOPRESSIN 0.2 u × 20 min Maximum 0.8 u/min Recheck at 24 h	TIPS/SCLEROSIS
EMBOLIZE Gelfoam Coils	

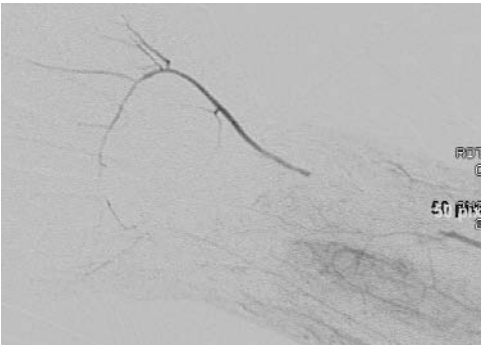
LGI

SB	LB
Leiomyoma AVM Ulcer	Diverticulosis Angiodysplasia Cancer Polyps
↓	↓
VASOPRESSIN Except AVM (surgery)	EMBO VS SURGERY



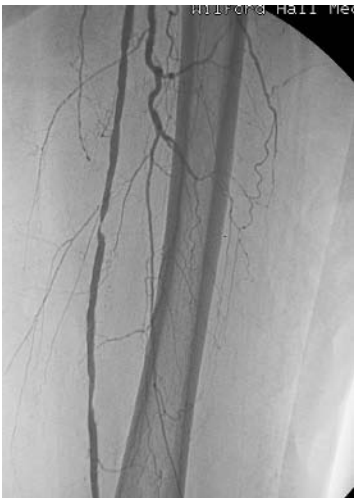
UPPER EXTREMITY

- Atherosclerosis
- Thoracic outlet syndrome
- Vasculitis—Raynaud’s or Buerger’s
- AVM
- Trauma



LOWER EXTREMITY

<i>Viable</i>		<i>Threatened</i>	<i>Irreversible</i>
ANGIOGRAPHY		SURGERY	AMPUTATION
<i>Embolus</i>	<i>Thrombus</i>	Bypass	
Menisci	Occlusive		
Multiple	Collaterals		
↓	↓		
Heparin	Thrombolysis		
Coumadin			



7

Nuclear Medicine

Includes radiopharmaceuticals, dynamic and static nuclear imaging of pathophysiological processes, and quality control of nuclear imaging instruments.

Lung Imaging

V/Q SCAN

Clinical

HIGH probability: 80% chance PE

LOW probability: 80% chance of no PE

VENTILATION

1. 20 mCi Xe-133

80 keV

Gas

T1/2 = 5 d

2. 4-5mCi Tc-99m-DTPA

140 keV

Aerosol

T1/2 = 6 h

Initial phase	30 s	–Ventilation
Equilibrium phase	3 min	–Lung volumes
Washout phase	3 min	–Exclude obstructive disease

PERFUSION

4 mCi Tc-99m-MAA (10-40 μ)

1 million particles

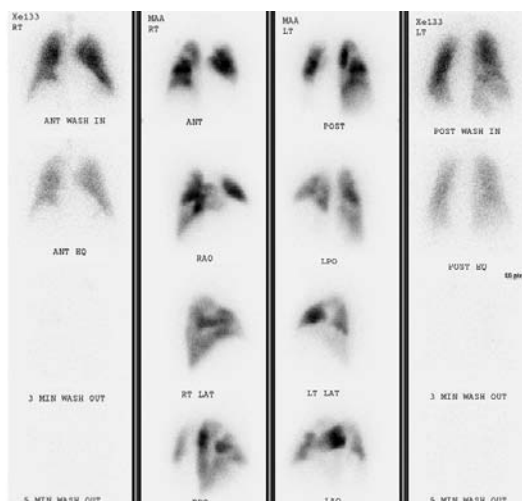
T1/2 = 6 h

Defect Size

- Small <25%
- Moderate 25–75%
- Large >75%

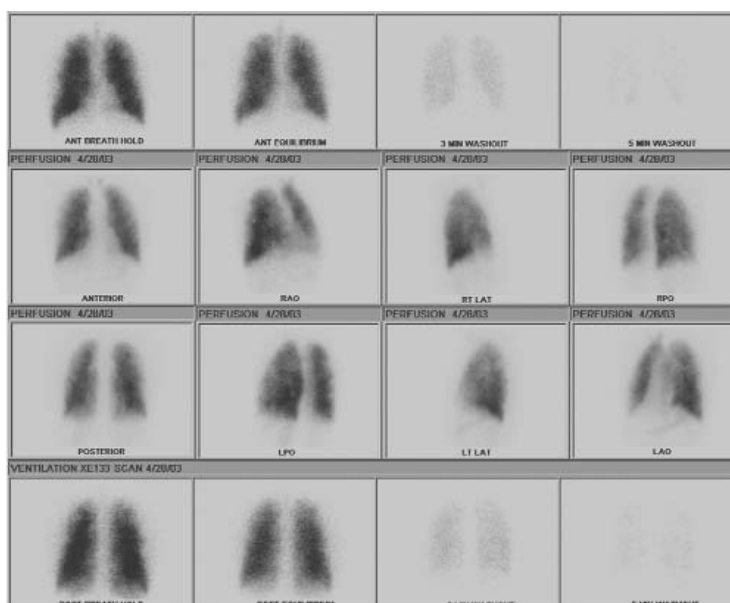
High Probability

2 large/mismatched defects or the arithmetic equivalent in moderate or large defects



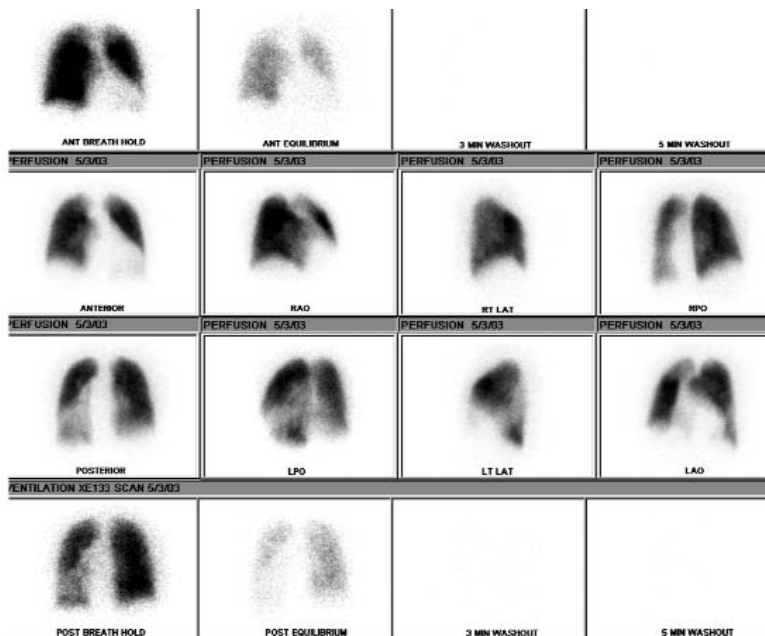
Intermediate Probability

1 large/2 moderate mismatched perfusion defects or the arithmetic equivalent in large and moderate defects

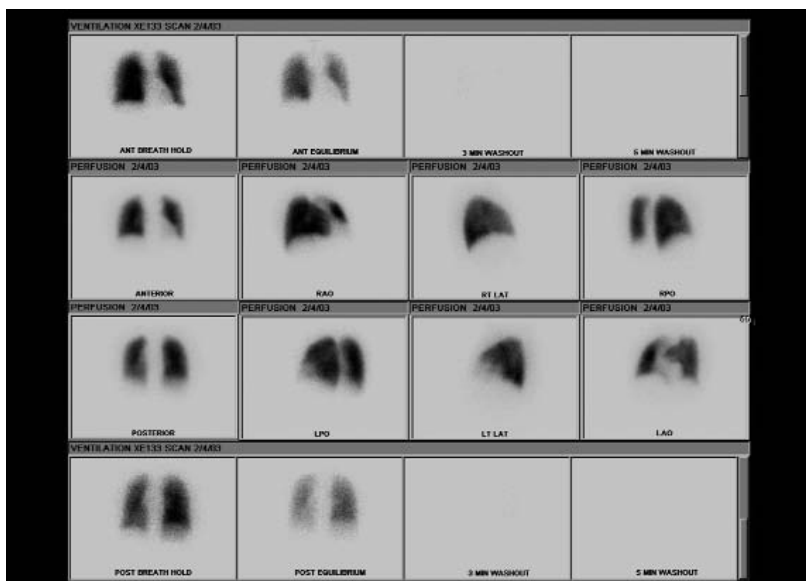


Low Probability

>3 small defects

**Very Low Probability**

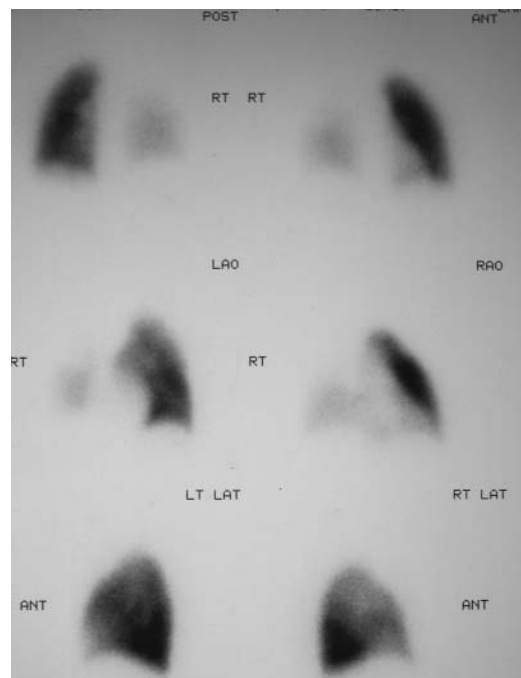
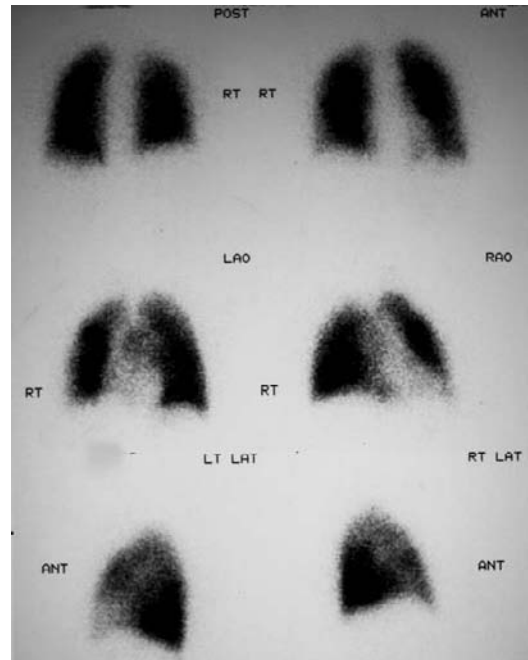
Nonsegmental defects (i.e., cardiomegaly, prominent hila, enlarged aorta), >2 matched defects



V/Q MISMATCH

DDX

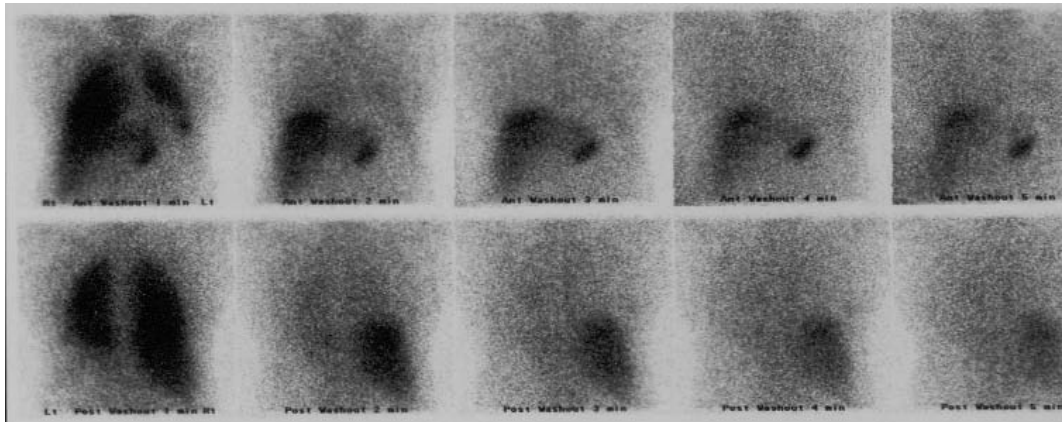
1. Primary vascular disease (vasculitis)
2. Radiation therapy
3. PE/previous embolus
4. Lymph nodes/Hilar carcinoma/sarcoma/lymphoma



LIVER UPTAKE

Early: Fatty liver

Late: Right heart failure



Endocrine

THYROID

Approach

1. Palpable or nonpalpable nodule → nodule evaluation study
2. Clinical: Hyperthyroid? → radioactive iodine uptake study
3. Malignancy: Metastatic disease? → metastatic search

1. RADIOACTIVE IODINE UPTAKE STUDY

I-123

200-300 μ Ci

24-h uptake

N10-30%

2. THYROID SCAN

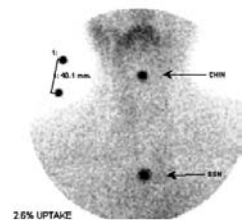
FUNCTIONAL

Hyperthyroid

1. Graves/Hashimoto's thyrotoxicosis
Diffuse increased uptake



2. Subacute thyroiditis
Diffuse decreased uptake

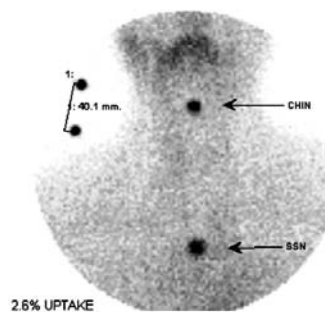


3. Toxic/Multinodular (Plummer)
Nodule uptake
4. Painless, Postpartum



Hypothyroid

Hashimoto's
Surgery
Radiation



Nodule Evaluation

I-123

159 keV
100–200 μ Ci orally
Pinhole collimator
Co-57 String or spot marker
T_{1/2} = 9 mo

Tc-99m

140 keV
5–10 mCi
Pinhole or straight bore

SCAN PATTERNS

1. Normal-Diffuse Symmetric

2. Nodule

COLD

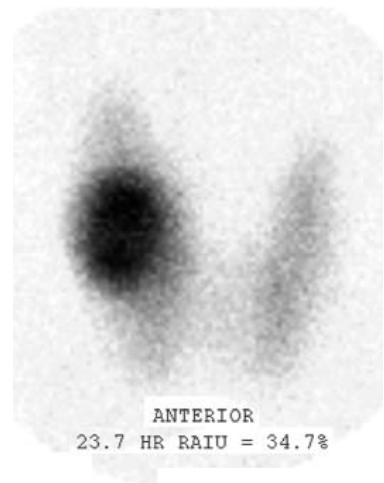
CATCH PALM

Cancer
Adenoma
Thyroiditis
Colloid Cyst
Hematoma
Parathyroid
Abscess
Lymph node/lymphoma
Metastasis



HOT

Functioning adenoma
Malignancy <1% (rule out discordant)
Multiple
-less likely malignant



METASTATIC DISEASE

I-131

Oral

364 keV

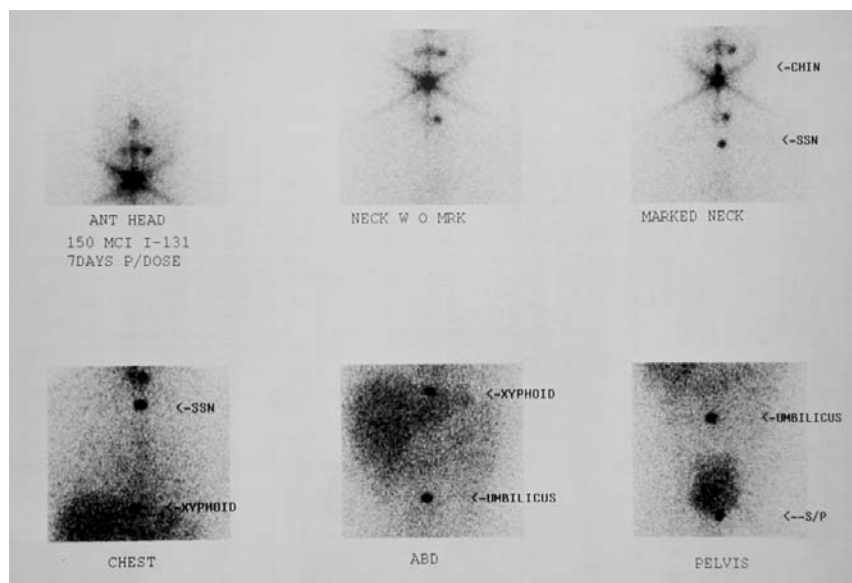
5–10 mCi-diagnosis

10 mCi-Grave's disease

100 mCi-Thyroid bed ablation

>200 mCi-Pulmonary fibrosis results

Normal uptake heart, stomach, bladder, stomach



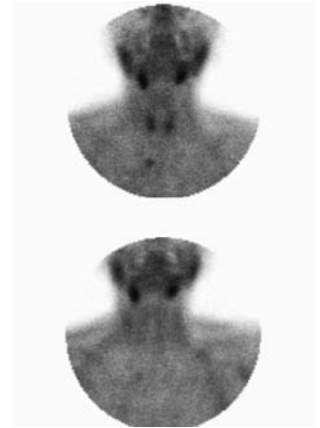
PARATHYROID SCAN

25 mCi Tc-99m Sestamibi

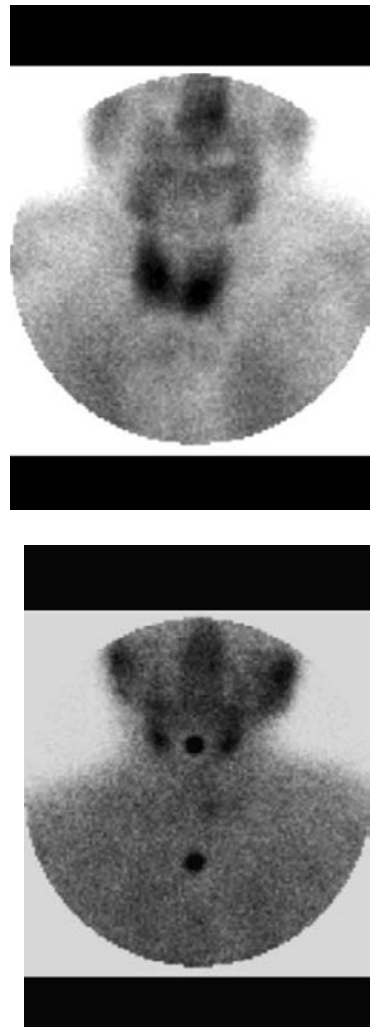
DUAL WITH Tc-99m (uptake in heart is a clue)

Uptake only in abnormal glands (>35–50 g)

Parathyroid adenoma-single site



Parathyroid hyperplasia-multiple sites



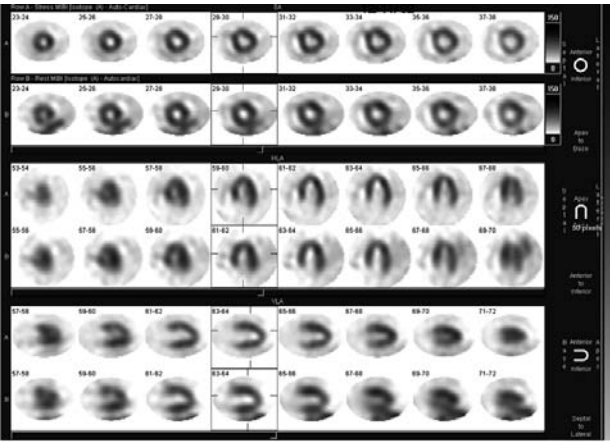
Cardiac Imaging

1. VIABILITY

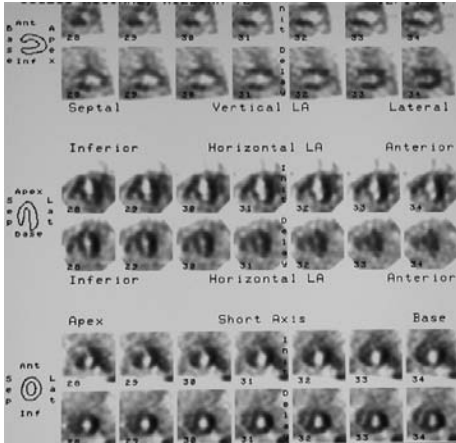
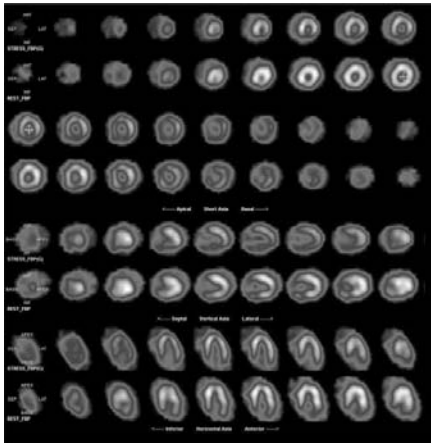
- THALLIUM
- PET

2. ISCHEMIA

- GATED
- PLANAR



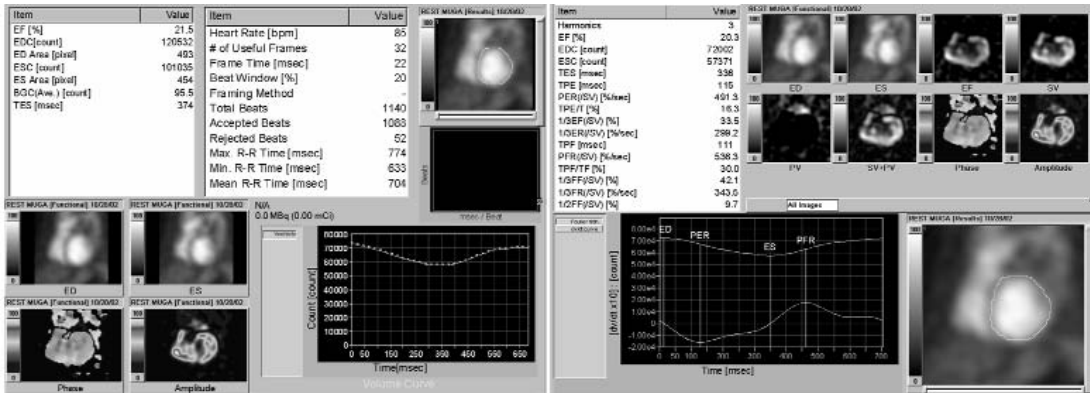
Normal



Ischemia

3. VENTRICULAR FUNCTION

- FIRST PASS
- MUGA



CARDIAC PERFUSION

PROTOCOLS

1. Thallium-201

Rest

4 mCi

$T_{1/2} = 3 \text{ d}$

70 keV (Hg X-rays)

15 min post-injection imaging

Exercise

20 mCi Tc-99m-MIBI

45 min post-injection/exercise imaging to allow clearance of liver

2. Alternates

2 Step MIBI 8 Mci/24 Mci doses

Tc-99m Teboroxime

PHYSIOLOGY

LAD Territory

Ant 2/3

Apex

Septum

RCA Territory

Inferior wall

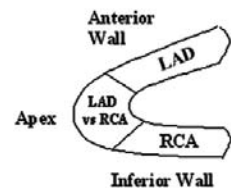
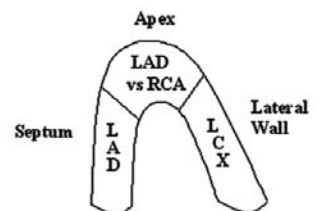
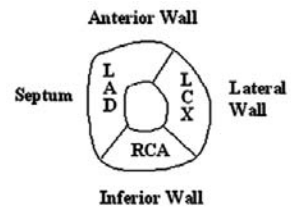
Inferior apex

Inferior 1/3 septum

L. Circumflex

Inferolateral wall

Inferior wall (marginals)



Inflammatory Imaging

IN-111 WBC SCAN

500 uCi

172, 247 keV

Medium Energy Collimator

Image at 24 h or 6 h/24 h

$T_{1/2} = 3 \text{ d}$

Indications

1. Fever of unknown origin
2. Infection
3. IBD F/U



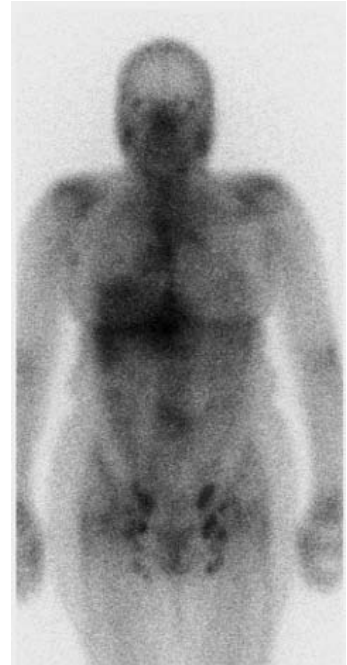
GA-67 SCAN

5 mCi
 90, 190, 290, 390 keV
 Medium Energy Collimator
 Image 24 h, 48 h
 $T_{1/2} = 3 \text{ d}$

Indications

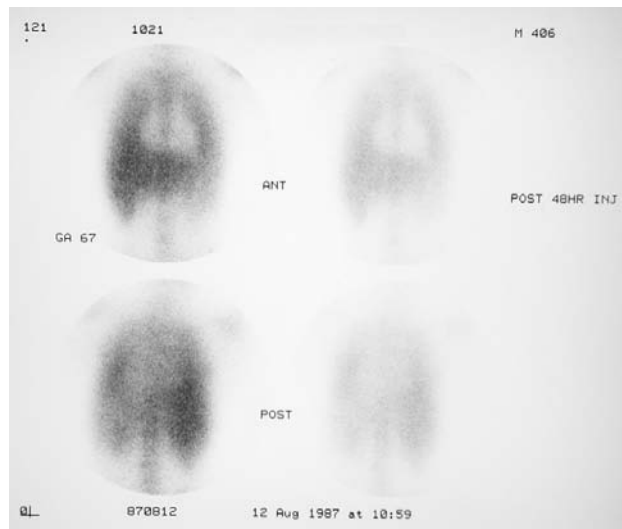
LISA

Lymphoma
 Infection (Lung)(MAI)
 Sarcoid
 Abscess



INFECTION/INFLAMMATORY DDX

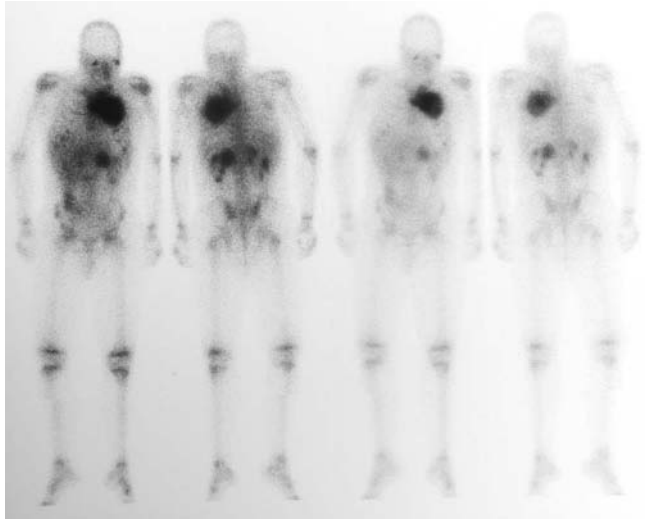
1. Lung-sarcoid
2. Lung-Pneumonitis
3. Abscess/Cellulitis/Osteomyelitis



TUMOR DDX

1. Lymphoma
2. HCC
3. Sarcoma
4. Melanoma
5. Testicular Carcinoma

NB: No Uptake in KAPOSI



Neurological Imaging

BRAIN SCANNING

Tc99m HMPAO

Tc-99m ECD

20 mCi

140 keV

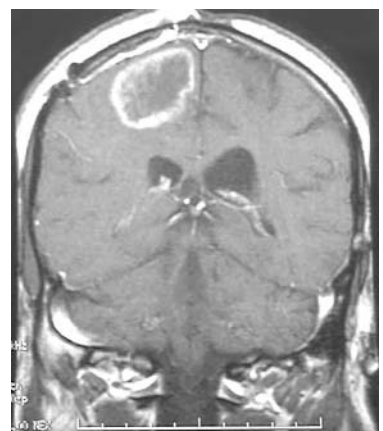
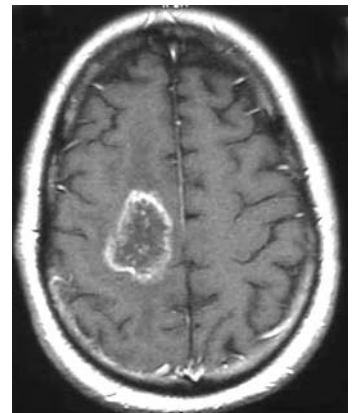
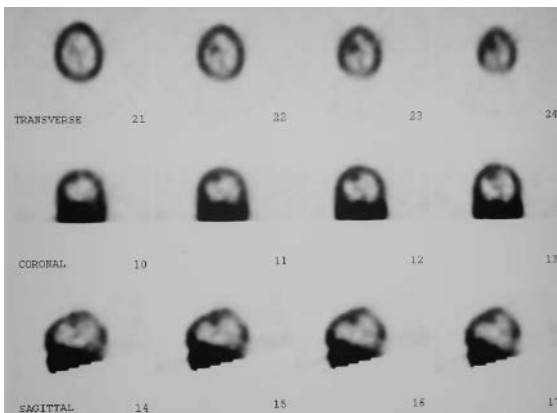
T1/2 = 6 h

Indications

1. Stroke—defect
2. Dementia
3. Epilepsy
4. Brain death
5. Tumor

Tl-201 (will see Orbit uptake)

- a) Lymphoma (+) vs Toxo (—)
- b) Tumor (uptake) vs Necrosis (no uptake)



CSF

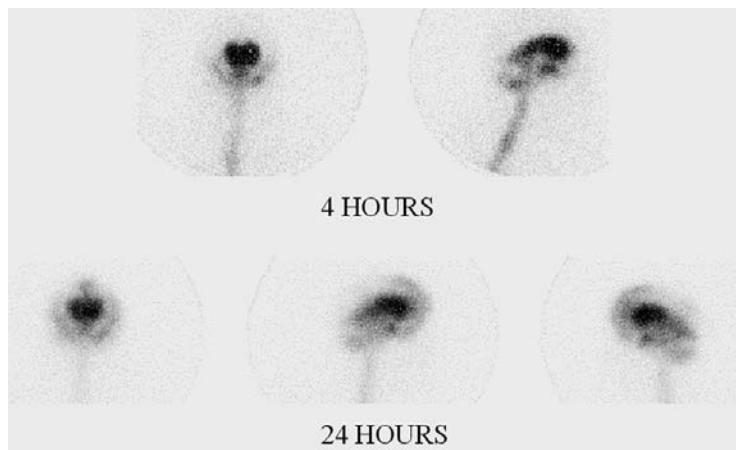
In-111 DTPA

500 uCi

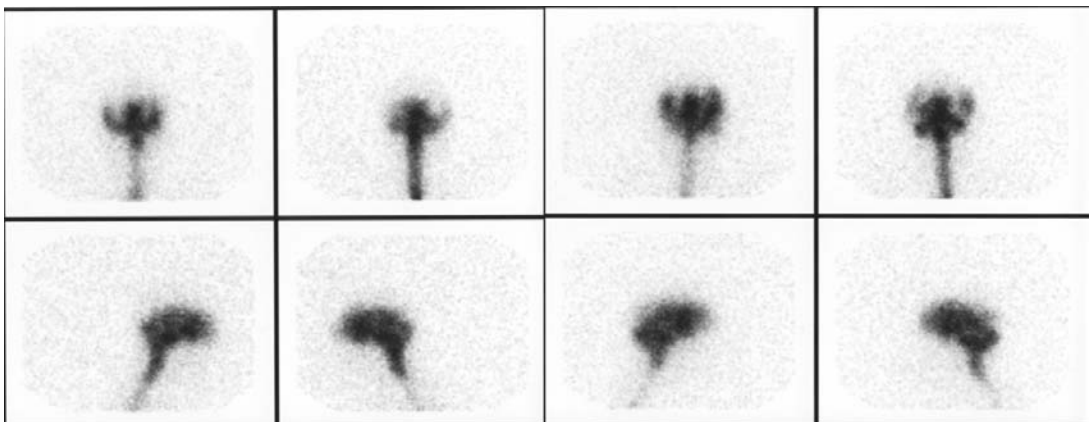
174/247 keV

Indications

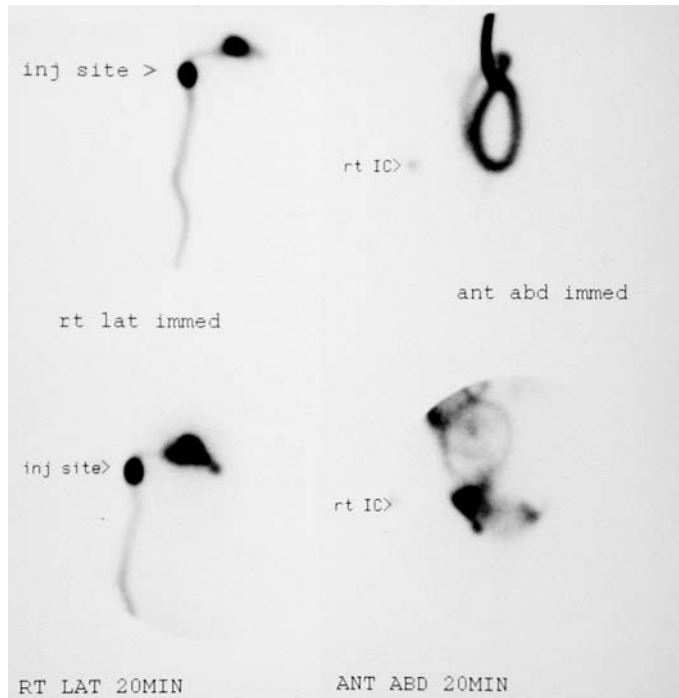
1. Dementia–NPH–immed/4 h/24/48 h
 - Early filling with reflux into ventricles abnormal (no normal reflux into ventricles)
 - Delayed clearance



2. CSF LEAK



3. CSF SHUNT



Gastrointestinal Imaging

GALLBLADDER/LIVER

Tc-99M DISIDA

Tc-99m MEBROFENIN

5 mCi

NPO after midnight

Q5 min × 60 min, then Q1min/frame

All purpose collimator

$T_{1/2} = 6 \text{ h}$

Evaluation

1. Does the patient have a gallbladder?
2. Prompt hepatic uptake? Peak uptake? Distribution?
3. Appropriate blood pool washout?
4. Prompt excretion into intra and extra hepatic ducts?

POTENTIAL SCENARIOS

1. *Bile Duct Obstruction*

Normal state:

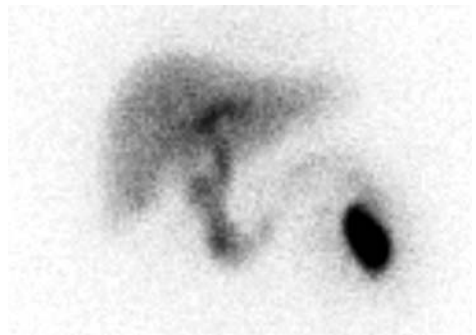
Uptake in liver	5-10 min
CBD	10 min
GB	60 min
Intestinal	60 min

Any delay beyond this is indicative of obstruction

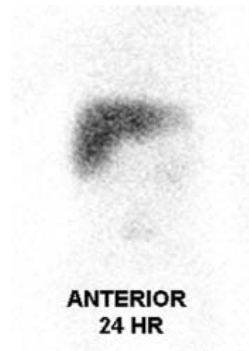
2. *Acute Cholecystitis*

Augment study by giving:

Morphine 0.04 mg/kg
Sincalide 1–2 µg slow i.v. 30 min
Delay 4–6 h

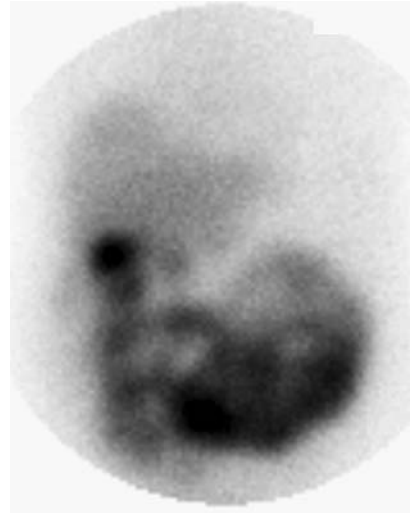


3. *Biliary Atresia*



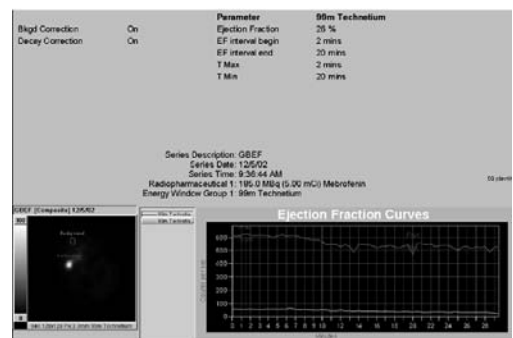
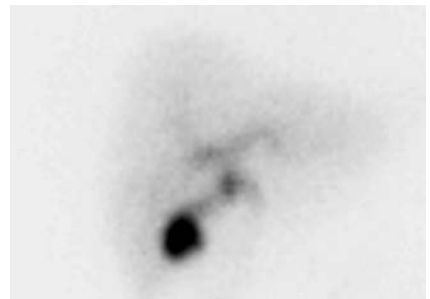
4. Biliary Leak

Cystic duct remnant
 Choledochoceles
 Bowel



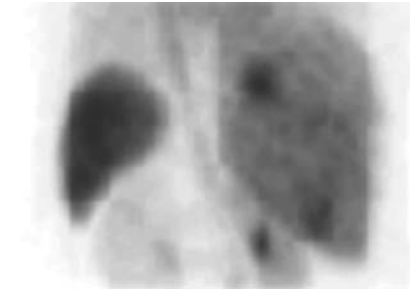
5. GB Ejection Fraction

Sincalide 0.02 $\mu\text{g}/\text{kg}$
 a. Dyskenesia
 b. Normal = $>30\%$ at 30 min



LIVER/SPLEEN

Tc-99m Sulfur colloid
4 mCi
20 min after injection
All purpose
Planar images



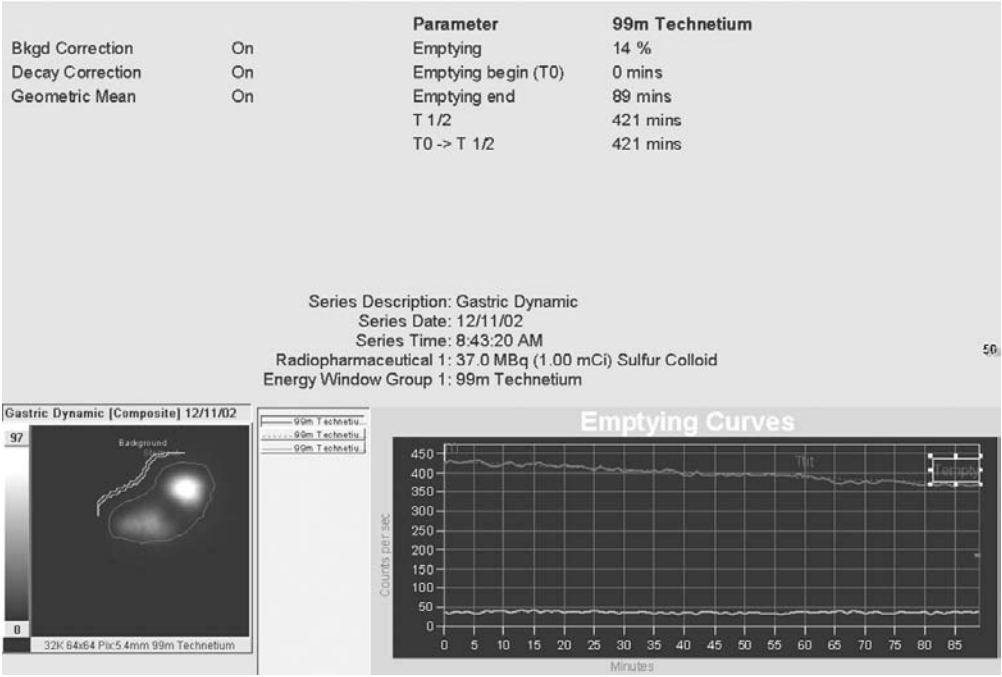
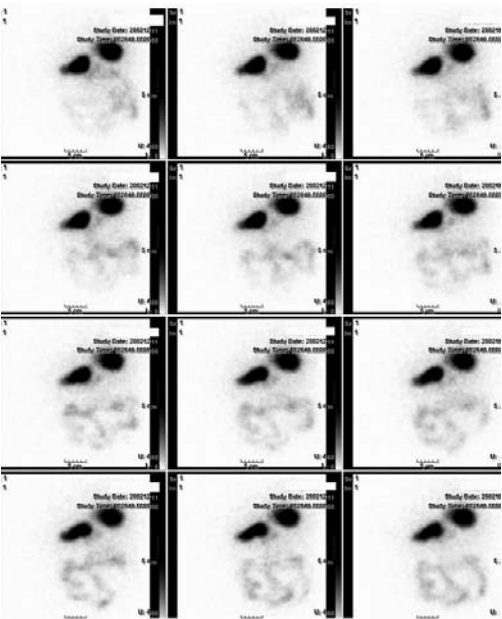
GI BLEEDING

Tc-99m Sulfur colloid 8 mCi
Tc-99m Pertechnate labeled RBC 20 mCi
Q1 min/1 h
Requires active bleeding



GASTRIC EMPTYING

Tc-99m Sulfur colloid 0.5 mCi



Neuroendocrine Imaging

I-123/I-131 MIBG SCAN

5 mCi (I 123)

0.5-1mCi (I131)

24-h imaging

159/364 keV

Low count images due to dose

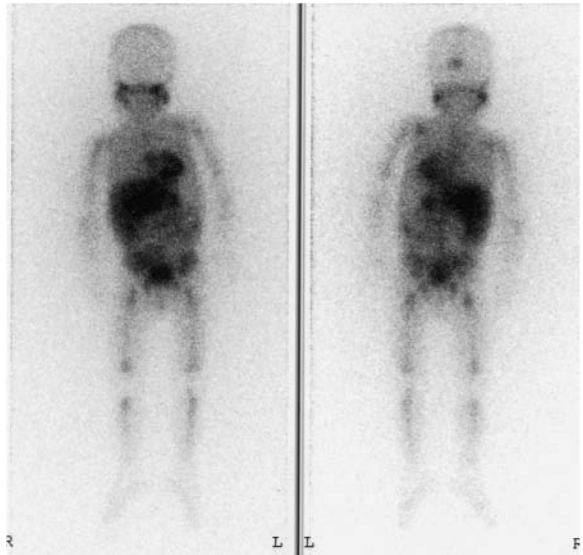
Normal uptake in bladder,

thyroid (if not blocked),

heart, stomach, liver, spleen

No bone uptake

Abnormal uptake in other regions



I-111 PENTRETOTRIDE/OCTREOTRIDE SCAN

Uptake in liver, spleen, and both kidneys

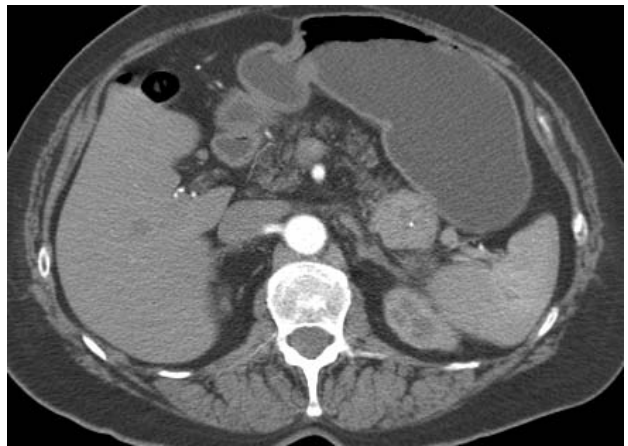
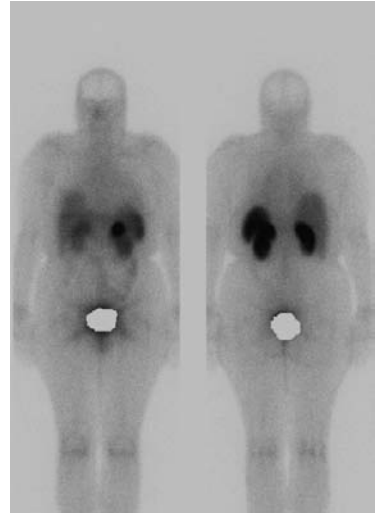
Whole body images obtained

5 mCi

24-h imaging

172/247 keV

Primarily used for carcinoid and endocrine tumors



Renal Imaging

RENAL SCAN

Tc-99m MAG 3: 5 mCi

Tc-99m DTPA: 15 mCi

Tc-99m DMSA: 5 mCi

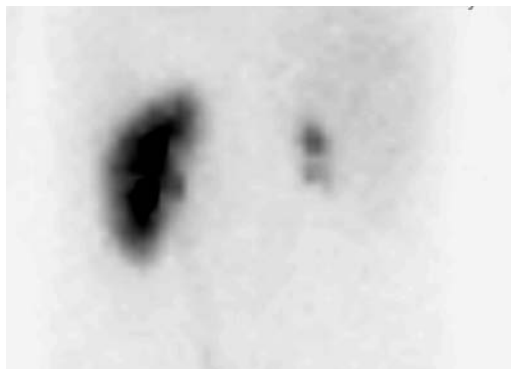
Indications

<i>Nontransplant</i>	<i>Transplant</i>
1. Obstruction	Viability
2. Function	
3. Hypertension	

Evaluation

1. FLOW-Peak kidney uptake at 6 s equal to aortic uptake
2. FUNCTION
 - a. Uptake
 - b. Distribution
 - c. Excretion (Prompt?)
 - d. Symmetry
 - e. Gradual washout
 - f. Tracer in bladder

Lasix administration should cause 50% drop after 10 min



RADIONUCLIDE VCUG SCAN

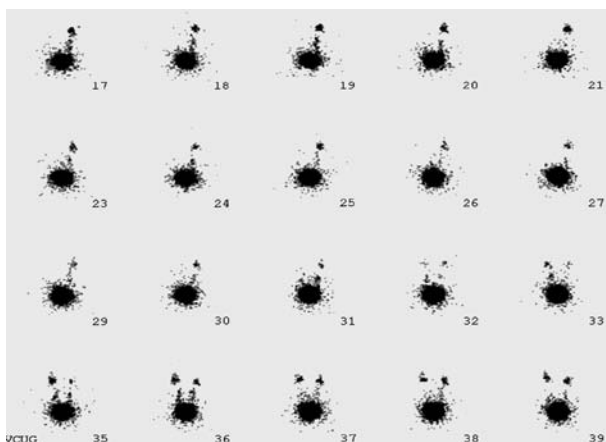
Tc-99m DTPA: 10 mCi

Reflux:

Grade I: Ureter

Grade II: Collecting system

Grade III: Severe



Musculoskeletal Imaging

SINGLE-PHASE BONE SCAN

Tc-99m-MDP: 10 mCi

3-h delay to allow soft tissue washout

HOT FOCI-INCREASE UPTAKE

Metastatic disease

Tumor

Trauma

Insufficiency

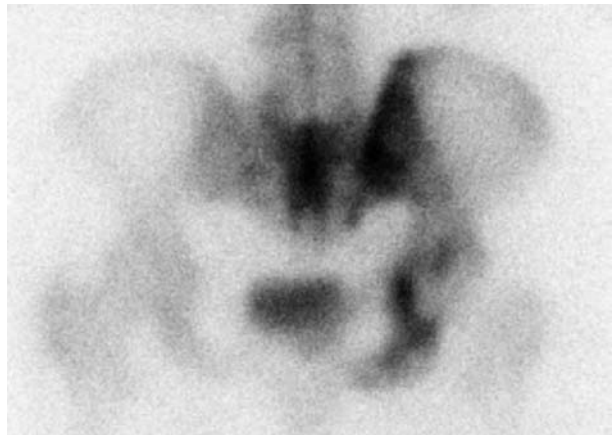
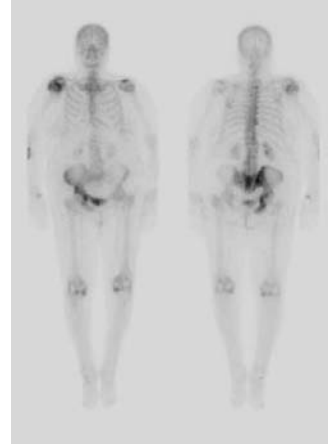
Pathological

Trauma

Pagets

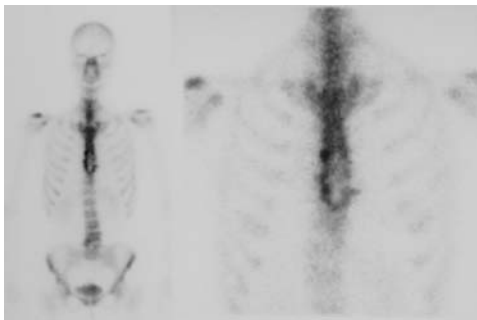
Arthritis

Osteomyelitis

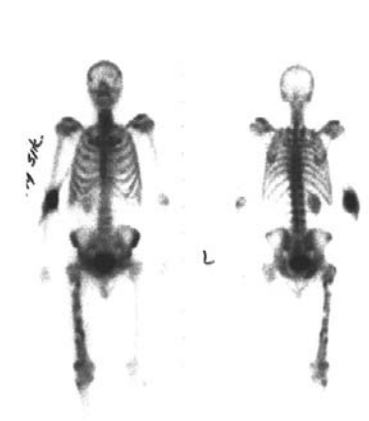


COLD FOCI: DECREASED UPTAKE

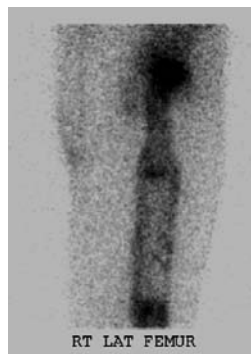
Myeloma



Renal cell/thyroid metastasis

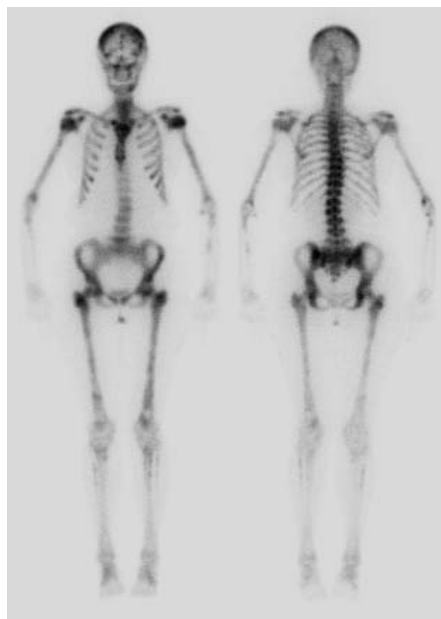


Bone cysts
Infarcts/AVN
Hardware
Abscess
Artifact



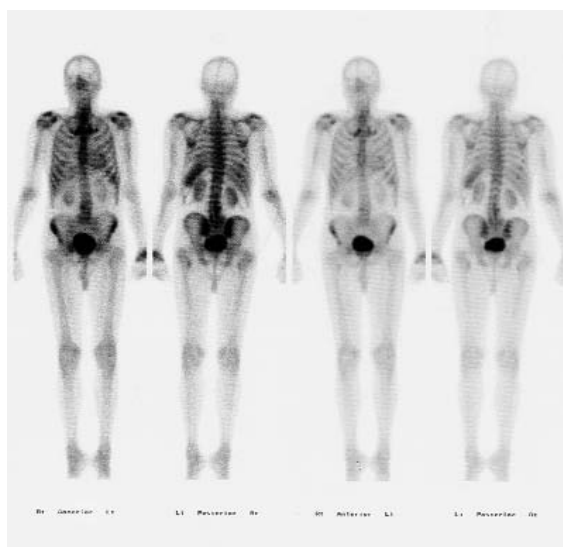
SUPERSCAN

Metastatic disease
HPTH
Osteomalacia severe



LIVER UPTAKE

Metastatic
Previous radionuclide administration
Aluminum contamination
Amyloidosis



THREE-PHASE BONE SCAN

Indications

1. Reflex sympathetic dystrophy
(flow at 2 mo normal, blood pool at 6 mo normal).
2. Infection



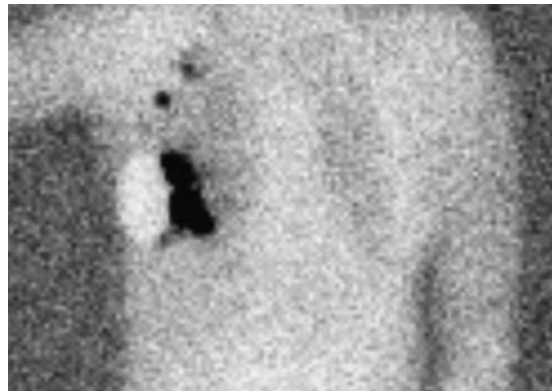
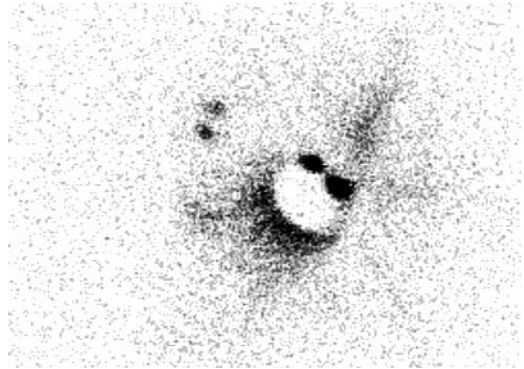
3. Neuropathic joint



Other

SENTINEL NODES SCAN

100 μ Ci filtered Tc-99m Sulfur colloid
Intradermal injections $\times$ 4
0.1 cc/injection
Flow images at 10 s/frame $\times$ 10 min
Co-57 transmission images are combined
IMAGE ALL BEDS: Chest, Abdo, etc...
2–5 nodes typical



PET

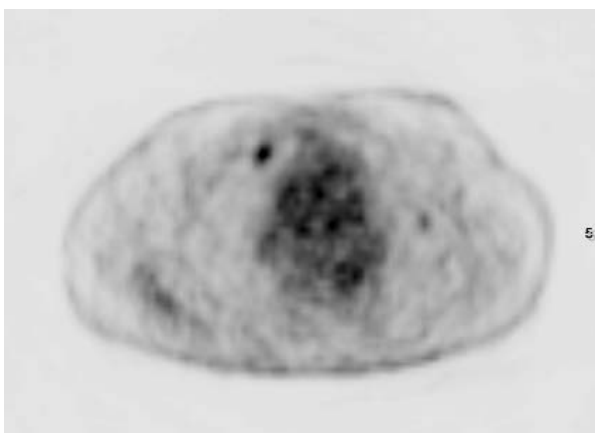
10 mCi F-18 FDG

T1/2= 110 min

511 keV annihilation photons

Image at 1 h

Attenuation correction



8

Ultrasound

Includes ultrasound imaging and Doppler ultrasound of the head and neck, thorax, abdomen, pelvis, extremities, breast, scrotum, and the vascular system as well as ultrasound evaluation of the fetus pregnant uterus.

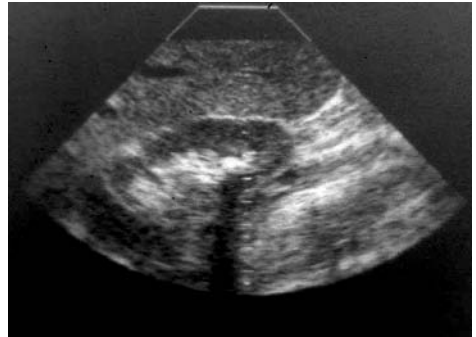
Note: Ultrasound is a different section than the other categories in that it is based on a modality rather than a subspecialty. Therefore, the cases are based on ultrasound findings rather than subspecialty entities. The following differentials are based on that principal.

ULTRASOUND FINDINGS

ECHOGENIC

Fat

Calcium—shadowing



Blood

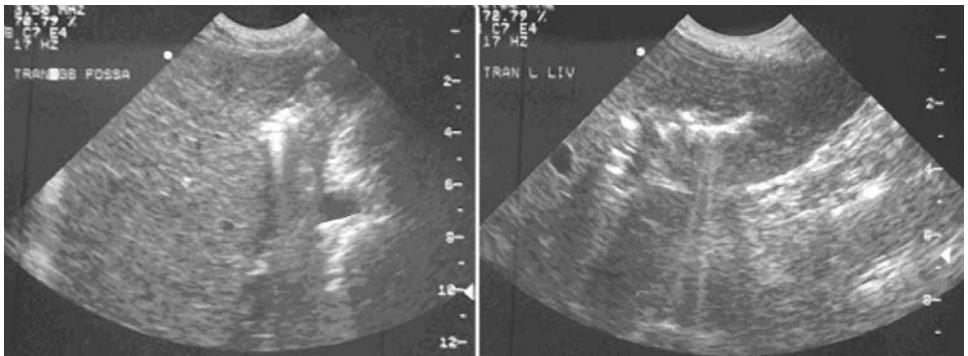


RING DOWN OR COMET-TAIL

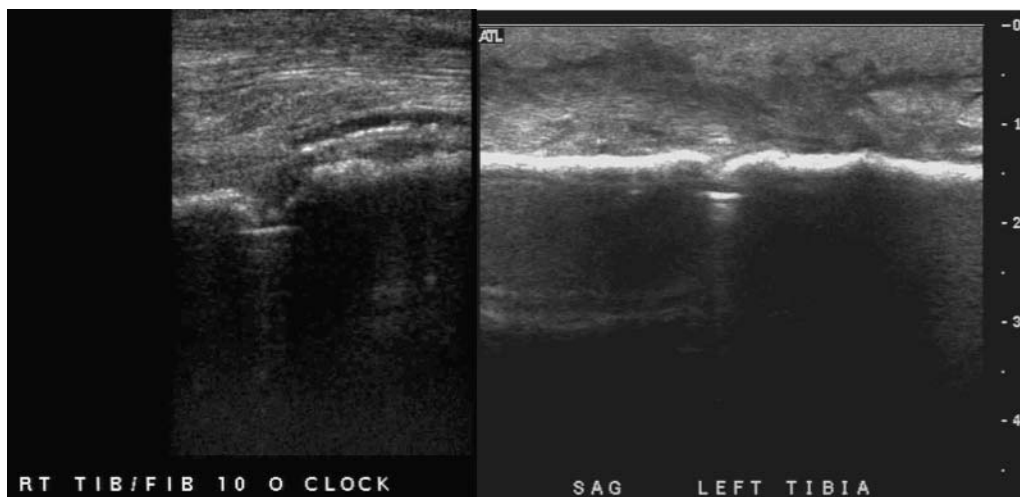
Cholesterol in the Rokitansky-Aschoff sinuses of gallbladder



Air



Metal



Gastrointestinal Ultrasound

LIVER

SOLITARY LIVER MASS

- Hepatocellular carcinoma—Cirrhosis
- Adenoma—Woman on oral contraceptive
- Focal nodular hyperplasia—Central scar
- Cholangiocarcinoma—accompanying biliary ductal dilatation
- Pyogenic abscess—Complex cystic
- Focal sparing of fatty liver—Gallbladder fossa, portal bifurcation



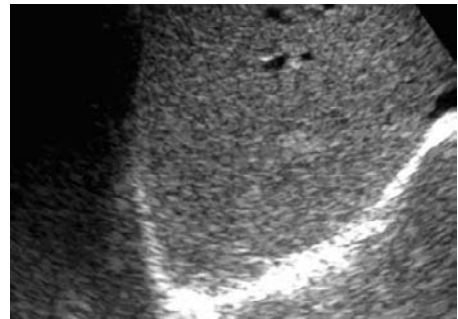
MULTIFOCAL LIVER LESIONS

- Metastases
- Microabscesses—Candida
- Other abscesses—Pyogenic, Amebic (complex cystic)



HYPERECHOIC LIVER LESIONS

- Hemangioma—MRI for confirmation
- Focal fat—next to falciform ligament in anterior aspect of segment 4, portal bifurcation
- Metastases—Mucinous such as colon or ovarian
- Any other primary liver tumor



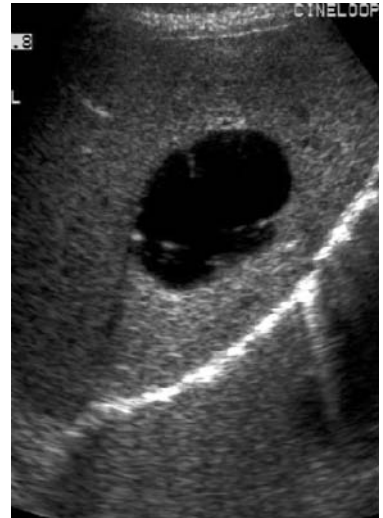
MULTIPLE CALCIFIED HEPATIC MASSES

Stones
Histoplasmosis
PCP



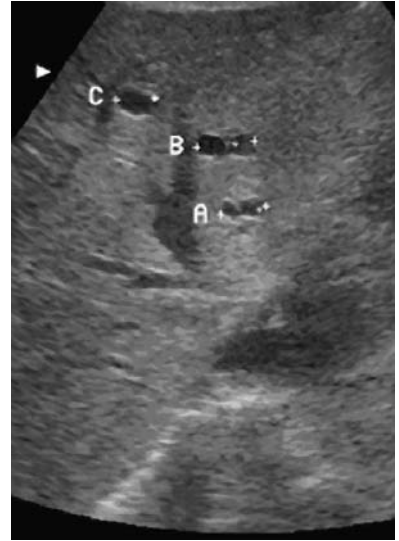
COMPLEX CYSTIC MASS

Infection
Abscess—pyogenic or amebic
Echinococcus
Tumor
Cystic metastases—ovarian
Biliary cystadenoma
Hemorrhagic mass—e.g., adenoma (solitary)
Necrotic metastases—sarcoma
Trauma
Hematoma (solitary)
Biloma (solitary)



MULTIPLE SIMPLE CYSTS

Cysts
Caroli's



DIFFUSE INHOMOGENEOUS LIVER ECHOTEXTURE

Cirrhosis—ascites, surface nodularity
Metastases
Fatty infiltration—loss of portal triad hyperechogenicity
Lymphoma
Kaposi in immunocompromised



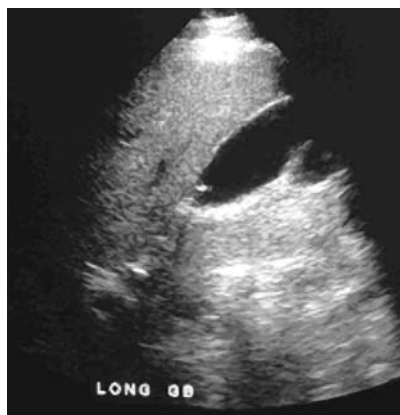
GALLBLADDER

SMALL INTRALUMINAL GALLBLADDER LESIONS

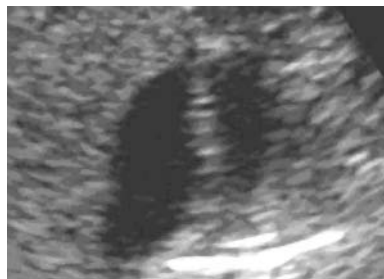
Stones—shadow, mobile



Cholesterol polyps—No shadow, not mobile

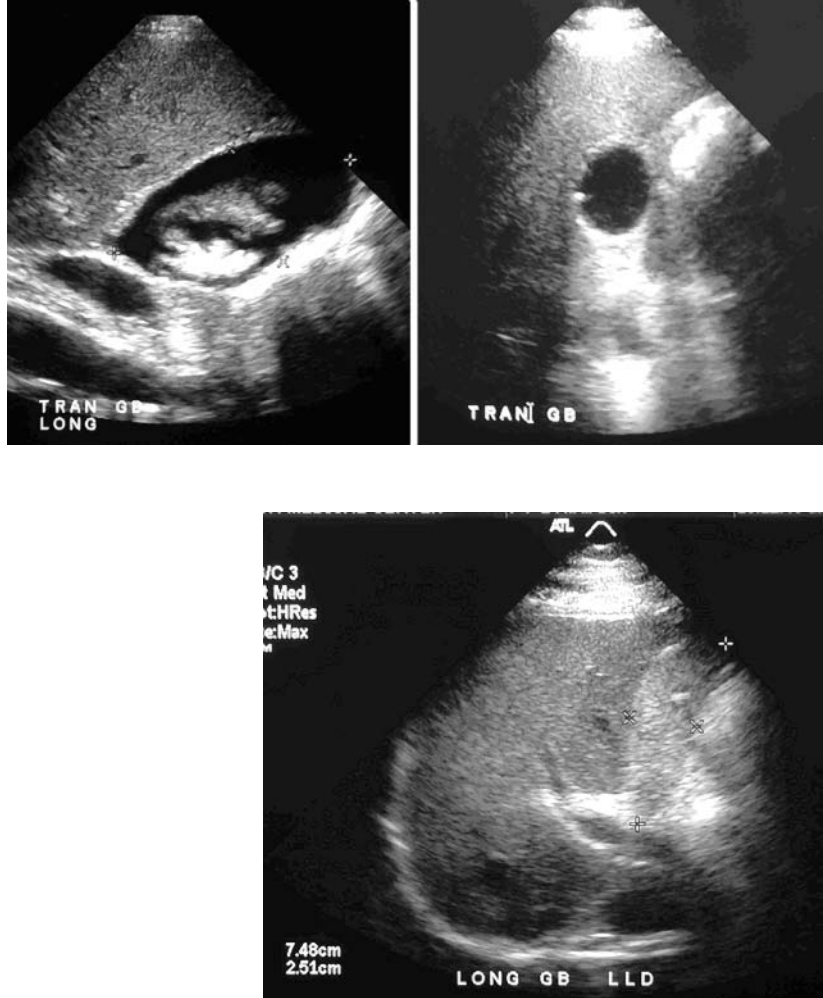


Cholesterol crystals—ring-down, not dependent



GALLBLADDER MASSES

Polyp—<1 cm
Tumefactive sludge—mobile
Focal adenomyomatosis
Chronic cholecystitis
Gallbladder carcinoma
Metastases—melanoma

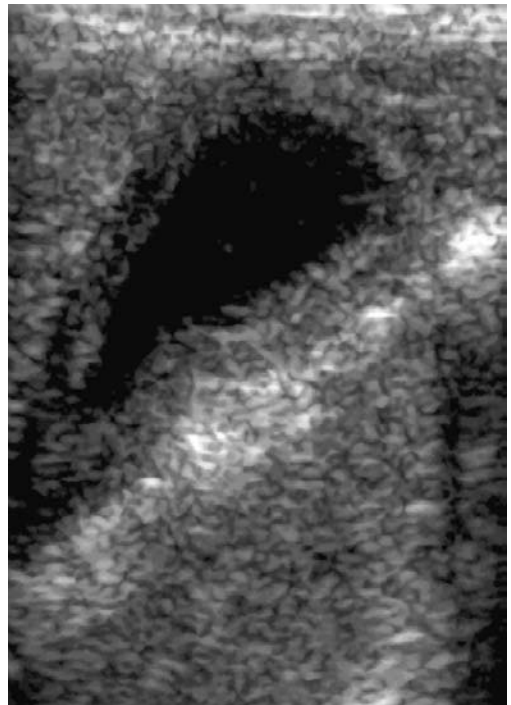


GALLBLADDER WALL THICKENING (MANY CAUSES)

Biliary—cholecystitis, adenomyomatosis, AIDS cholangitis

Edema—hypoproteinemia (cirrhosis, nephrotic syndrome), congestive heart failure

Hepatitis

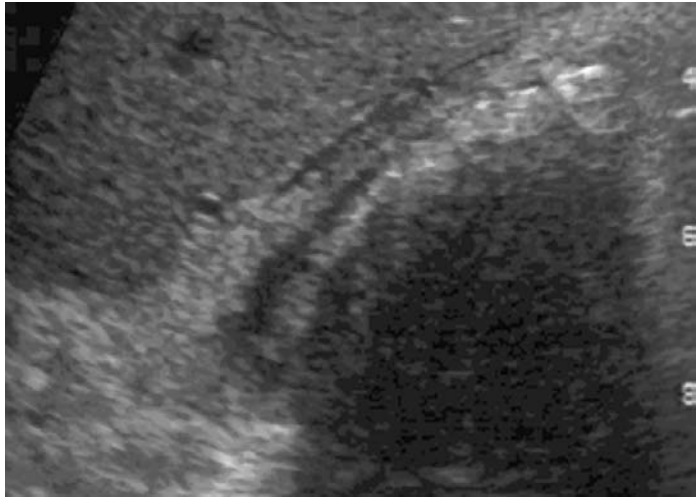


SHADOWING IN THE GALLBLADDER FOSSA

WES of stones

Porcelain gallbladder—must be removed because of increase risk of carcinoma

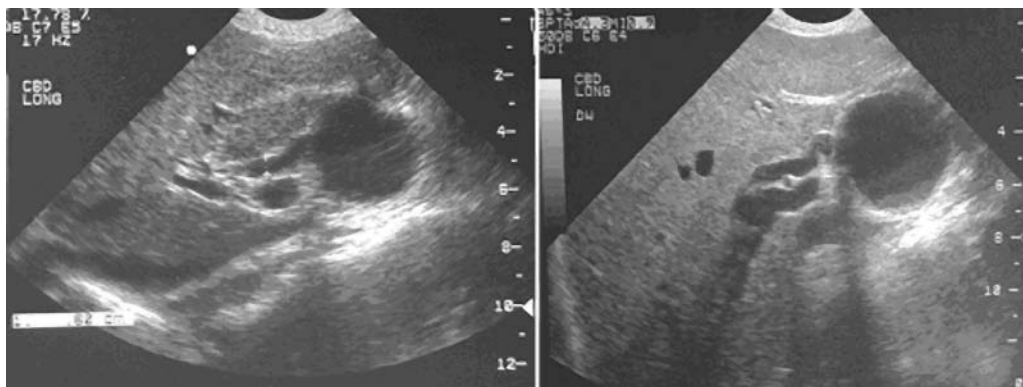
Emphysematous cholecystitis



BILIARY DUCTS

CYSTIC STRUCTURE IN REGION OF CBD

- Choledochal cyst
- Duodenal duplication
- Mesenteric cyst
- Pancreatic pseudocyst



BILIARY DUCTAL WALL THICKENING

Cholangitis

Sclerosing—also see strictures

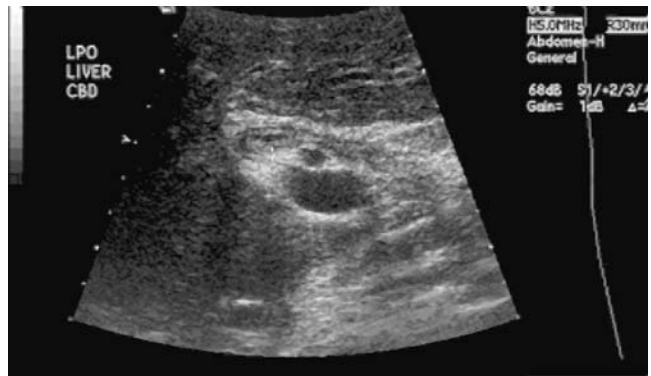
AIDS cholangiopathy—looks exactly like sclerosing cholangitis

Oriental cholangiohepatitis—stones

Ascending

Cholangiocarcinoma

Pancreatitis



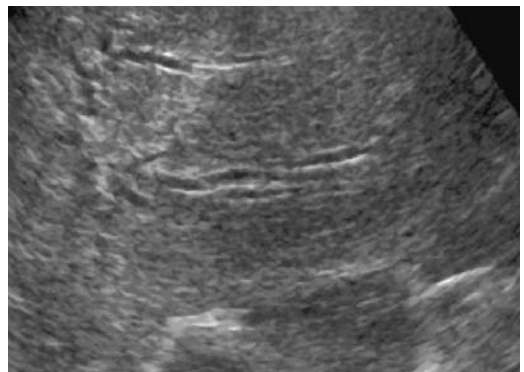
INTRAHEPATIC BILIARY DUCTAL DILATATION

Stone

Benign stricture—chronic pancreatitis

Pancreatic head mass

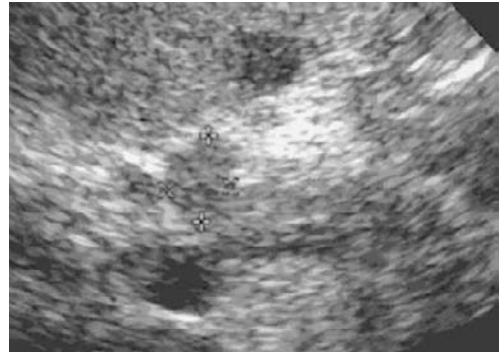
Klatskin tumor



PANCREAS

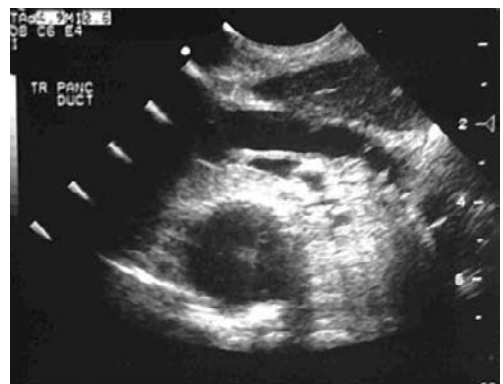
SOLID PANCREATIC MASS

- Adenocarcinoma
- Focal pancreatitis—calcifications
- Lymphoma
- Metastasis
- Islet cell tumor
- Peripancreatic lymph node



CYSTIC PANCREATIC MASS

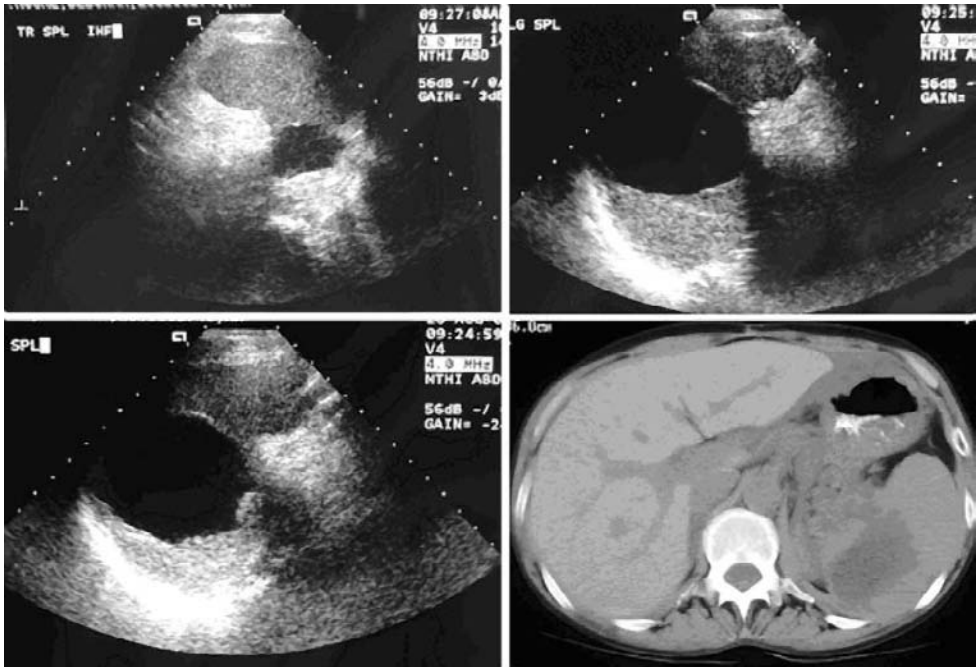
- Pseudocyst
- Macrocytic = mucinous cystadenoma/ carcinoma (middle-aged women)
- Microcystic = serous cystadenoma (middle-aged women)
- Solid and papillary epithelial neoplasm (young women)
- IPMT—dilated side branches, 85% malignant
- Aneurysm or pseudoaneurysm (pancreatitis)



CYST ADJACENT TO MEDIAL ASPECT OF SPLEEN

Pancreatic pseudocyst

Renal cyst



SPLEEN

CYSTIC SPLENIC MASS

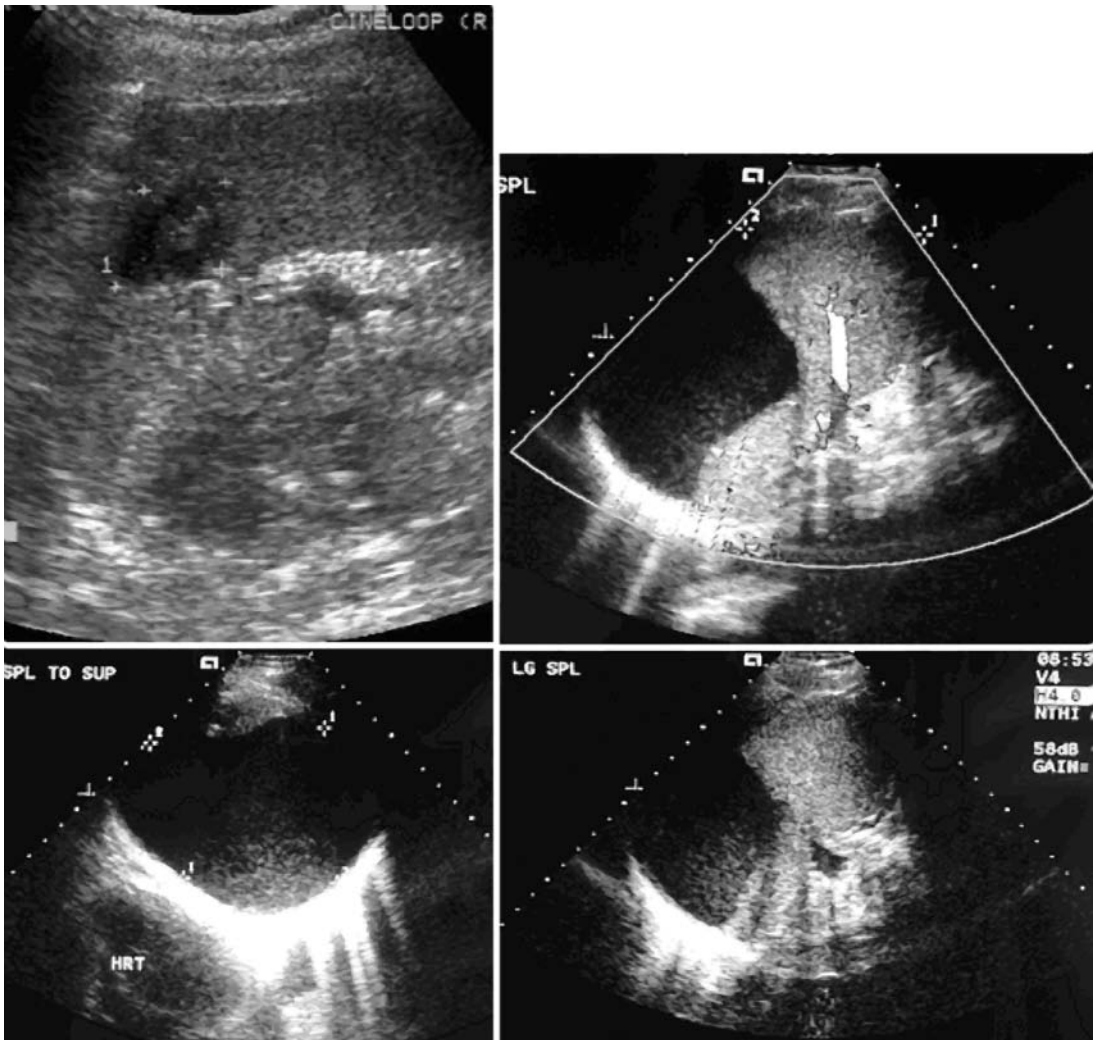
Pseudocyst—acquired from prior trauma or infarct; most common

Epidermoid cyst—congenital

Lymphangioma

Hematoma

Abscess



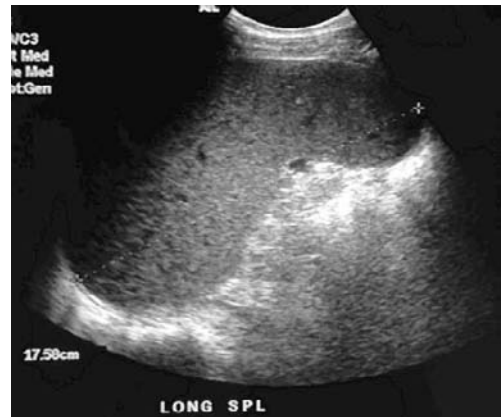
SOLID SPLENIC MASS

- Hemangioma—hyperechoic
- Lymphoma—may be multiple
- Infarct—wedge shaped
- Abscess—Candida gives multiple microabscesses
- Sarcoidosis—multiple



SPLENOMEGALY

- Portal hypertension
- Splenic vein thrombosis
- Leukemia/lymphoma
- Mononucleosis
- Glycogen storage disease
- Myelofibrosis



THYROID

THYROID MASS

CATCH

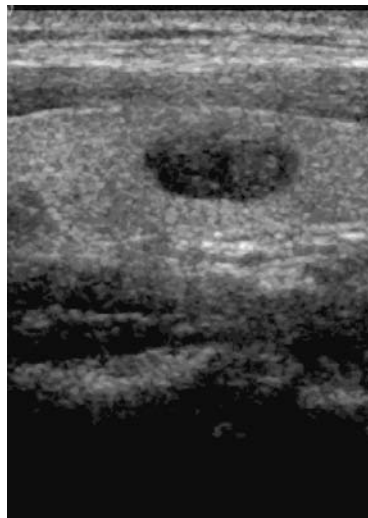
Carcinoma—microcalcifications

Adenoma

Thyroiditis

Colloid Cyst

Hyperplasia (Parathyroid gland)



Genitourinary Ultrasound

KIDNEY

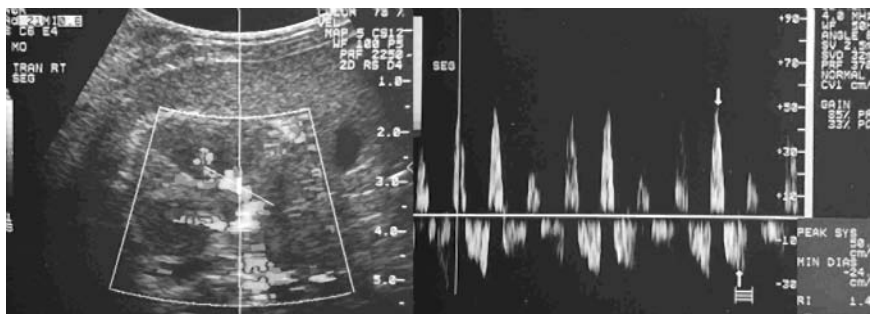
HYDRONEPHROSIS

Obstruction
 Reflux
 Active diuresis
 Congenital megacalyces



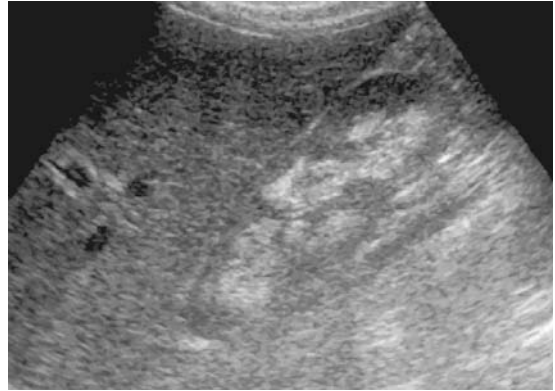
RI >0.7

Acute tubular necrosis
 Renal vein thrombosis
 Obstruction
 Complication in transplanted kidney = rejection, perinephric collection, cyclosporin toxicity



MEDULLARY NEPHROCALCINOSIS

Renal tubular acidosis
Medullary sponge kidney
Hyperparathyroidism



CORTICAL NEPHROCALCINOSIS

Chronic glomerulonephritis
Healed pyelonephritis
XGP
TB



PAPILLARY NECROSIS**NSAID**

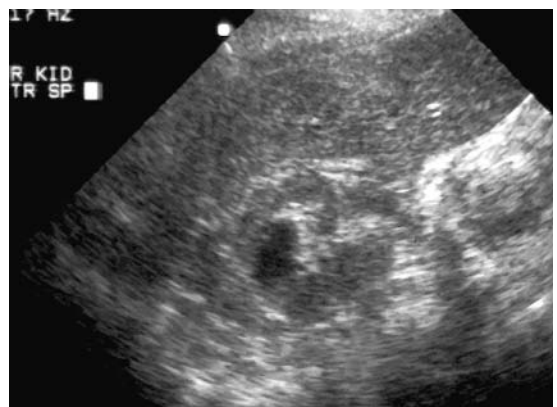
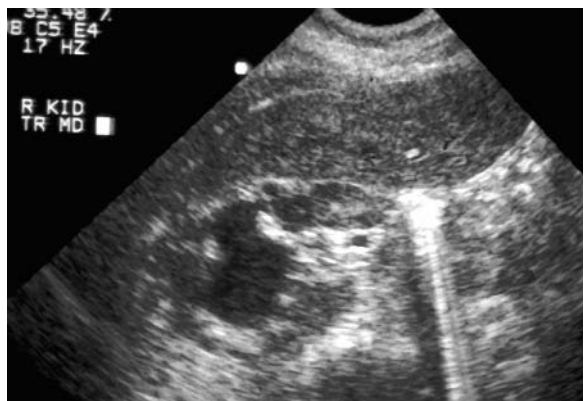
NSAID

Sickle cell

Analgesics

Infection (TB)

Diabetes



CYSTIC STRUCTURES ADJACENT TO RENAL HILUM

Hydronephrosis
 Peripelvic cysts
 Papillary necrosis
 Dilated renal vein



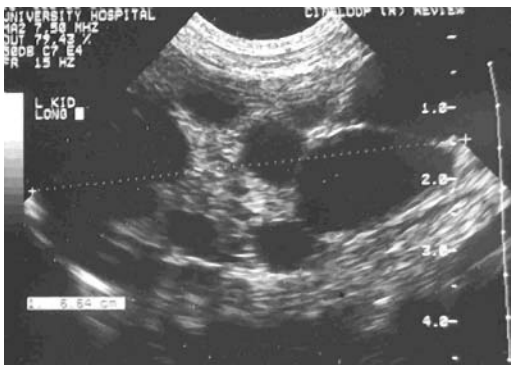
BILATERAL MULTIPLE RENAL CYSTS

Acquired cystic disease of dialysis—small kidneys, increased risk of RCC

ADPKD—enlarged kidneys, liver cysts, berry aneurysms

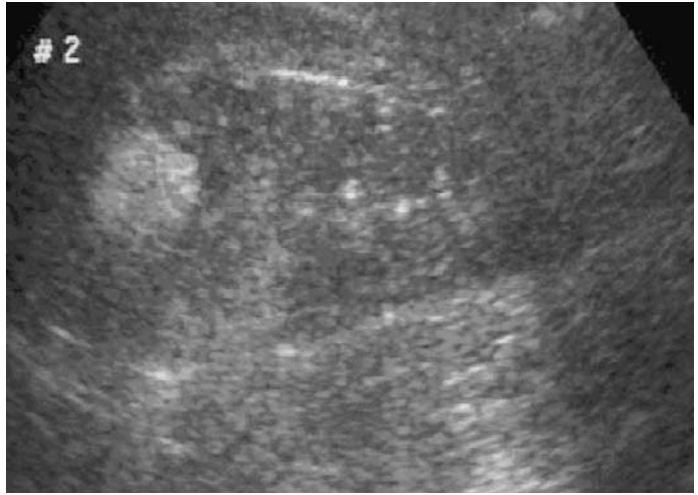
Von-Hippel Lindau—pancreatic cysts, increased risk of RCC, CNS hemangioblastomas, pheos

Tuberous sclerosis in kids—AMLs, cortical tubers, giant cell astrocytomas, periventricular nodules, cardiac rhabdomyomas, pulmonary LAM

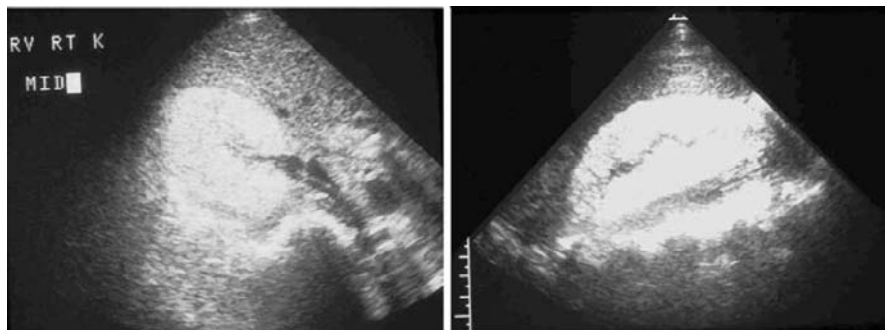


HYPERECHOIC RENAL MASS

Stone (shadow)
AML
RCC
Lobar nephronia

**ECHOGENIC KIDNEYS****GLAD**

Glomerulonephritis
Lupus
AIDS
Diabetes



SOLID RENAL MASS

Tumor

RCC

Lymphoma or mets—multiple

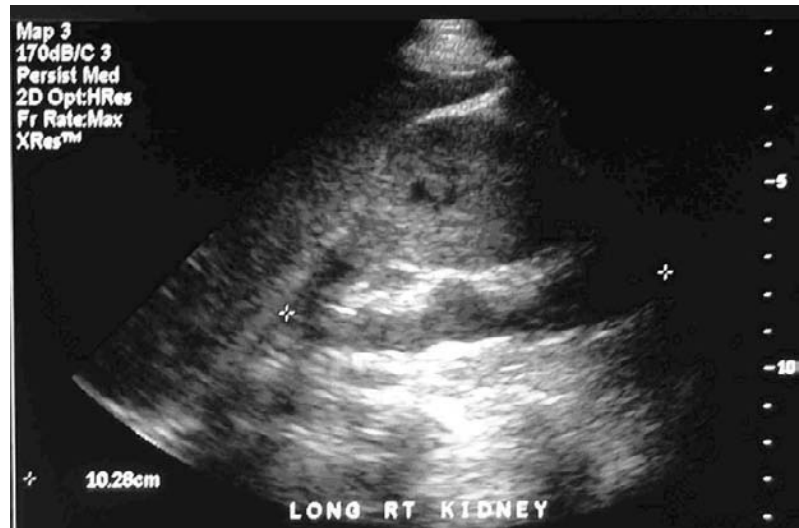
AML—hyperechoic

Oncocytoma—central scar

Lobar nephronia

Hypertrophic column of Bertin—extend into renal sinus

Focal parenchymal hypertrophy in atrophic kidney



COMPLEX CYSTIC RENAL MASS

Tumor—RCC, multilocular cystic nephroma

Hemorrhage into cyst

Abscess—fever

Hematoma—biopsy, trauma

Hemorrhage into mass—e.g., AML



ENLARGED KIDNEY WITH LOSS OF CORTICO-MEDULLARY ARCHITECTURE

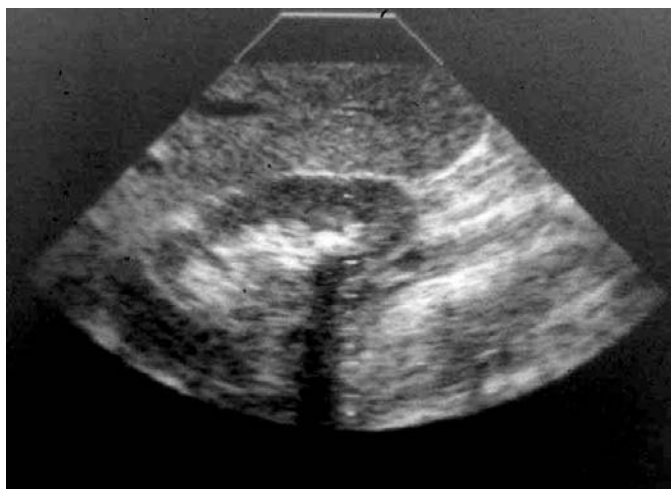
- Infection
- Renal vein thrombosis
- Rejection, ATN, or cyclosporin toxicity in renal Tx
- Lymphoma



SHADOWING FOCI ADJACENT TO RENAL HILUM

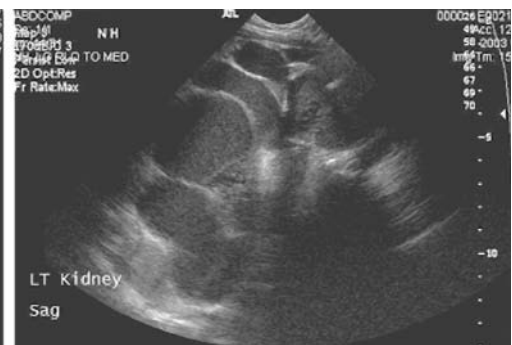
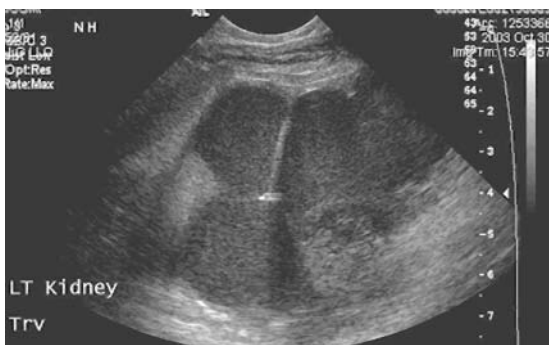
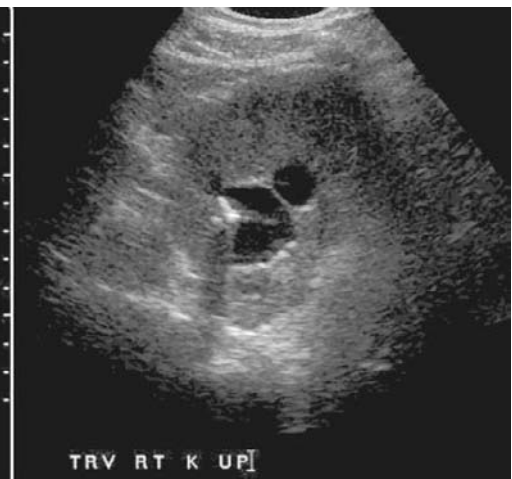
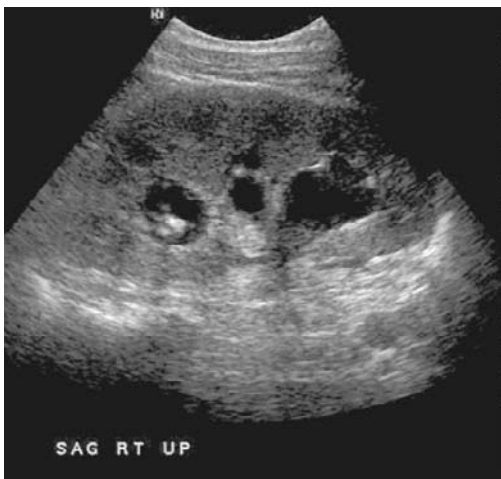
Stone

Renal artery calcification



ECHOGENIC MATERIAL IN COLLECTING SYSTEM

Stone
Clot
TCC
Pus
Fungus ball



FLUID COLLECTION AROUND TRANSPLANTED KIDNEY

Hematoma

Lymphocele

Urinoma—usually originate from ureteric implantation site into bladder

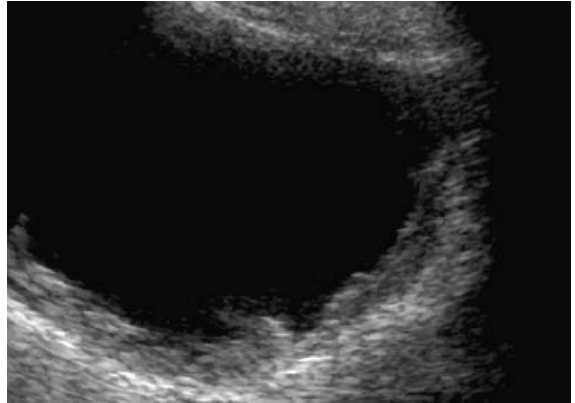
Abscess



BLADDER

THICKENED BLADDER WALL

Bladder outlet obstruction
Posterior urethral valves
Prostatic hypertrophy
Neurogenic bladder



TESTIS + PROSTATE

INTRATESTICULAR MASS

Tumor—Palpable

Primary malignant—seminoma, germ cell tumor

Primary benign—Leydig and Sertoli cell

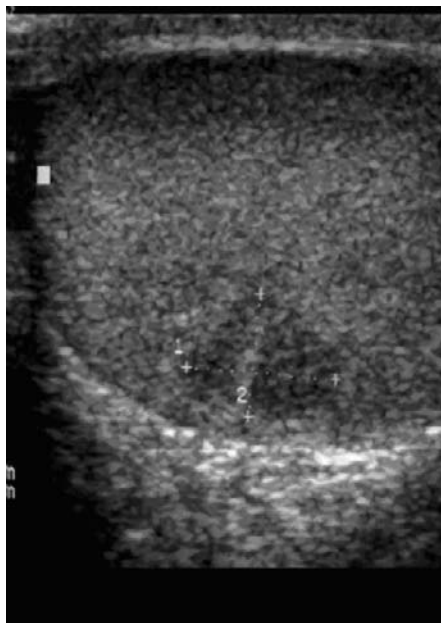
Metastasis—lymphoma

Infection—Nonpalpable

Focal orchitis

Abscess

Hematoma

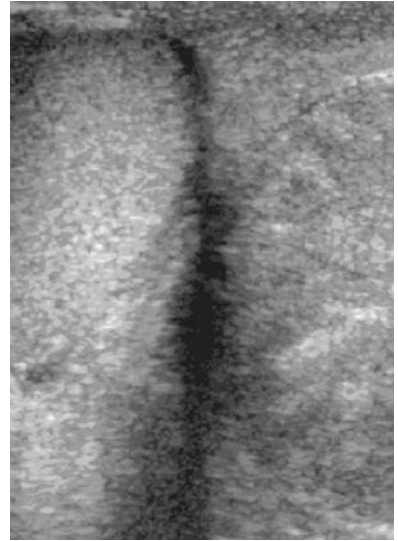


DIFFUSELY ENLARGED HYPOECHOIC TESTIS

Torsion—decreased flow

Orchitis

Tumor—lymphoma, seminoma

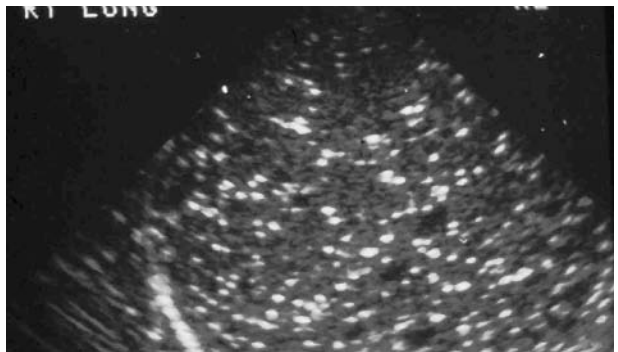
**HYPERECHOIC FOCI**

Testicular microlithiasis

Microcalcifications in undescended testis

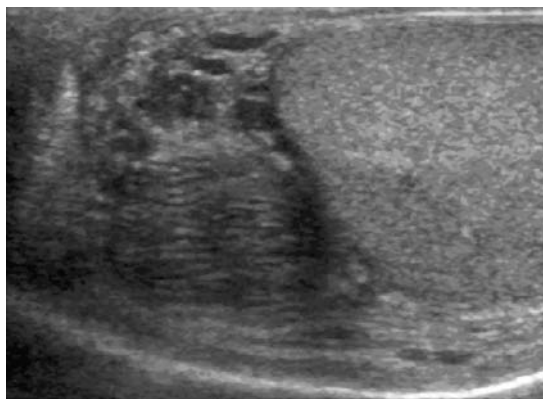
Klinefelter's Syndrome

Sarcoid



EPIDIDYMAL MASS

Focal epididymitis
Sperm cell granuloma—post-vasectomy
Benign adenomatoid tumor



HYPOECHOIC PROSTATIC NODULE

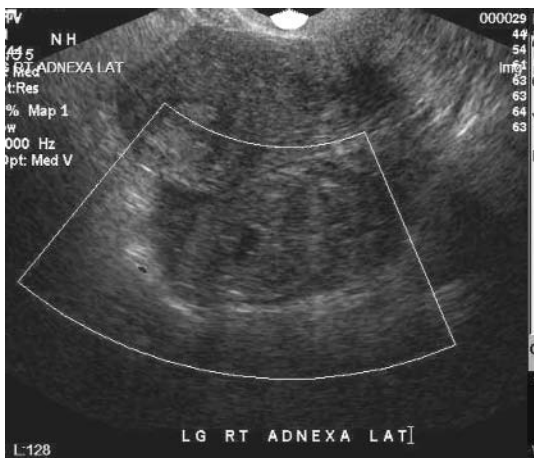
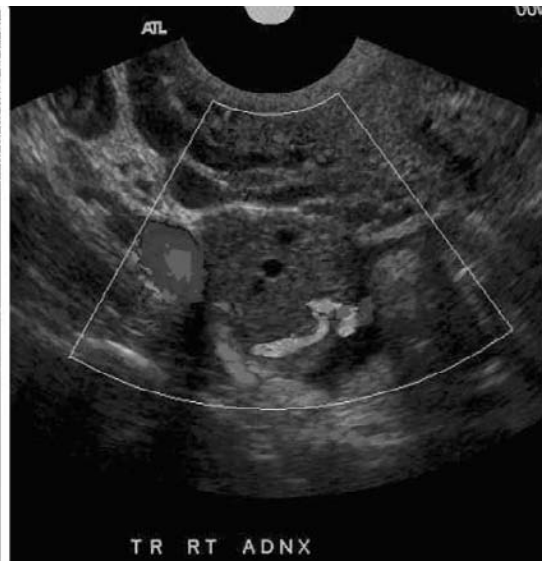
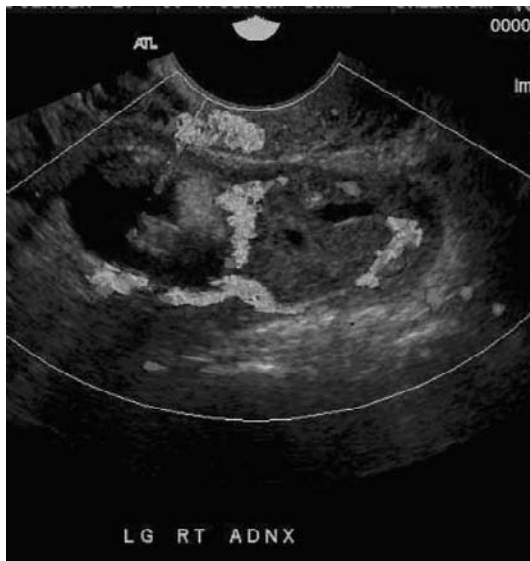
Malignant-Ca
Benign—prostatitis, BPH, infarct



Obstetrical Ultrasound

UTERUS

EXTRAUTERINE MASS WITH + β HCG = ectopic



000029 PREGN Gest
44 CR 1/1
54 CR 1/1
Im 61 RH LG PT ADNEXA
63 Gest Sac
63 0.57cm 5w1d
64 Yolk Sac
63
NEW
GA(LMP) 7w5d
+ 0.57cm

COMPLEX INTRAUTERINE MASS WITH + β HCG

Molar pregnancy

Failed pregnancy with retained products of conception

Decidual reaction of ectopic



GESTATION

EMPTY GESTATIONAL SAC IN FIRST TRIMESTER

Normal IUP <5 wk

Ectopic with pseudogestational sac

Failed pregnancy—blighted ovum; missed abortion

1000 u/5.0 wk—GS

>1000 u/5.5 wk—GS + YS

10,000+ u/6.0 wk—GS + YS + EMBRYO



OLIGOHYDRAMNIOS

GU anomalies—e.g., renal agenesis; obstruction

Spontaneous rupture of membranes—third trimester

Fetal demise >5 d



POLYHYDRAMNIOS

Idiopathic

Maternal diabetes

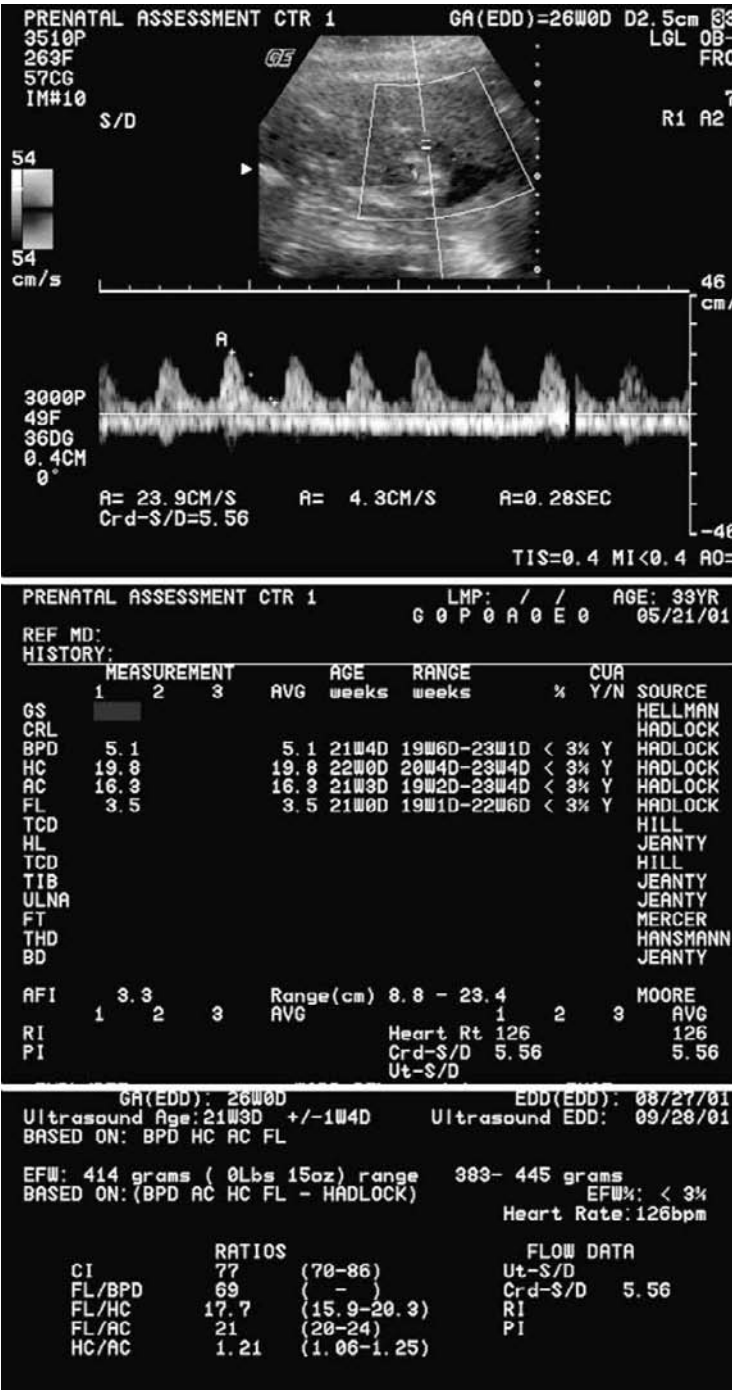
CNS or GI anomalies that inhibit swallowing

Hydrops



IUGR

Placental insufficiency—hypertension, diabetes
Smoking, drug abuse
Chromosomal anomalies



HYDROPS

Immune (rare now with RhoGam)
 Cardiovascular—arrhythmia, anatomic anomalies
 Chromosomal anomalies—karyotype
 TORCH infections—titers
 Anemias—umbilical cord sampling
 High output failure—sacroccygeal teratoma; chorioangioma
 Twin-to-twin transfusion syndrome



CNS + FACE

FLUID-FILLED SKULL

Hydrocephalus (mantle of cortex)
 Hydranencephaly (irregular hyperechoic areas of tissue)



THICKENED NUCHAL FOLD

First 11–14 wk 3 MM (IN–IN)

Second 15–20 wk 6 MM (OUT–OUT)

Trisomy 21

Turners



CYSTIC STRUCTURE ADJACENT TO SKULL

Cystic hygroma

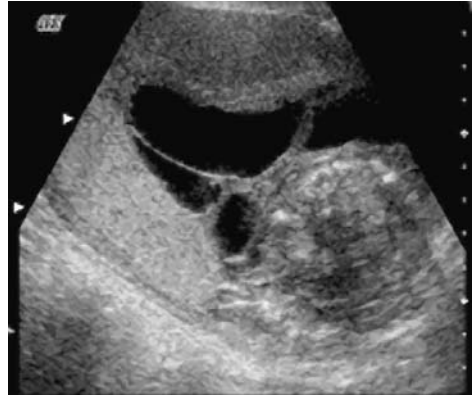
Encephalocele or myelomenigocele—calvarial defect; signs of open neural tube defect

Teratoma



CYSTIC HYGROMA

Chromosomes—Turner's, Trisomy 21
Lymphangiectasia
Hydrops



AGENESIS OF THE CORPUS CALLOSUM/SEPTUM PELLUCIDUM

Intrahemispheric cyst

- Colpocephaly
- Absent cavum



Dandy Walker
Chiari
Trisomy 13, 18



VENTRICULOMEGALY

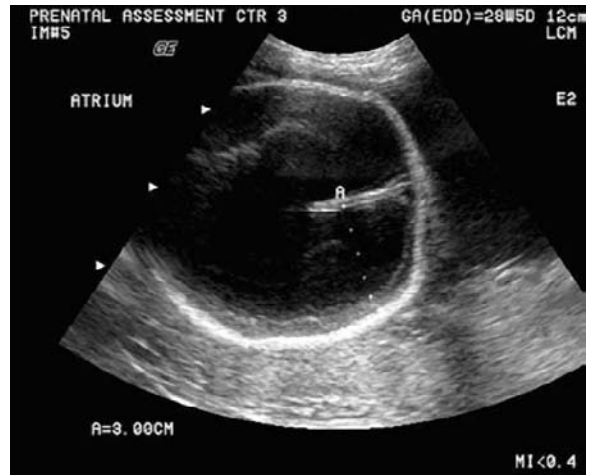
TORCH

Chromosomal—Trisomy 21

Intracranial bleed

Dandy-Walker, Chiari

Aqueductal stenosis



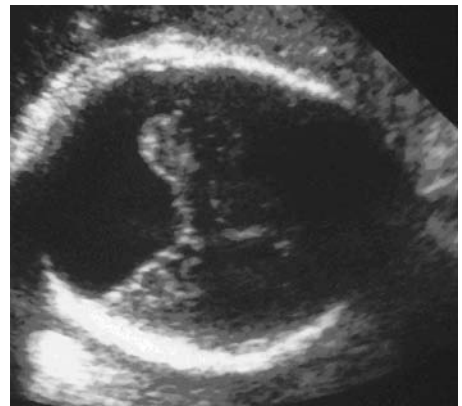
CYSTIC STRUCTURE IN POSTERIOR FOSSA

Normal before 8 wk

Dandy-Walker malformation or variant

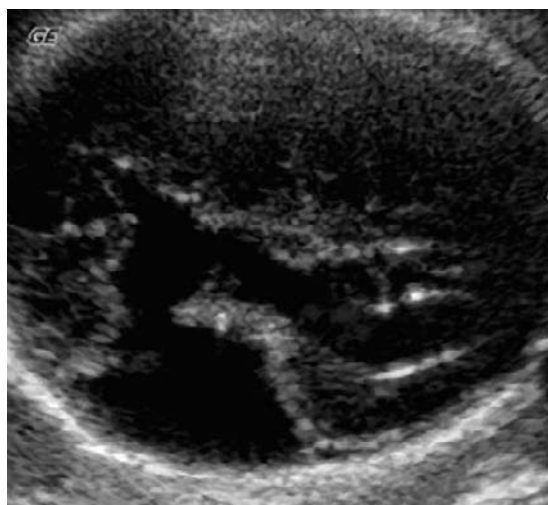
Mega cisterna magna

Arachnoid cyst



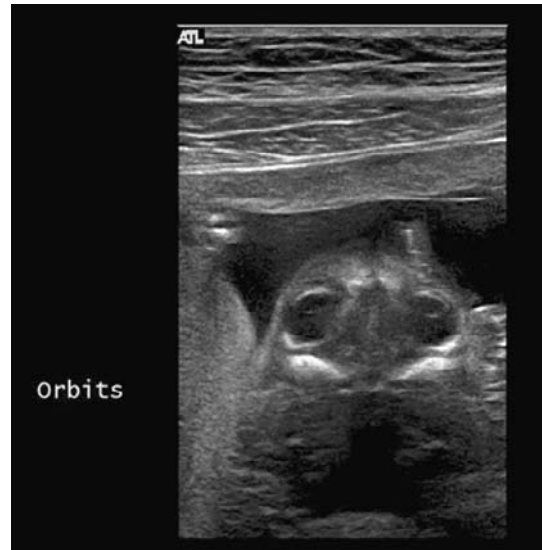
INTRACRANIAL CYSTIC STRUCTURE

Arachnoid cyst
Porencephalic cyst



HYPOTELORISM

Holoprosencephaly
Trisomy 13
Maternal phenylketonuria



HYPERTELORISM

Frontal encephalocele
Cleft lip sequence
Apert syndrome



CLEFT LIP AND PALATE

Chromosomal—trisomy 13

Teratogen—fetal alcohol

Holoprosencephaly



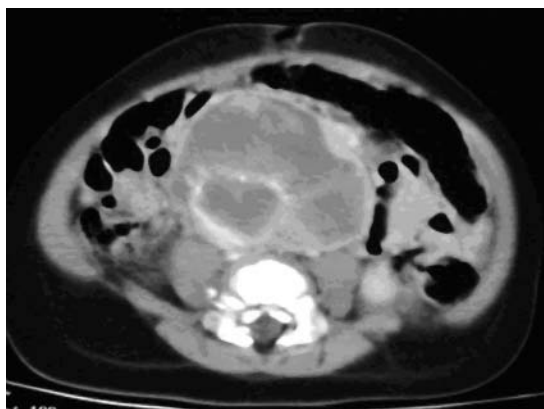
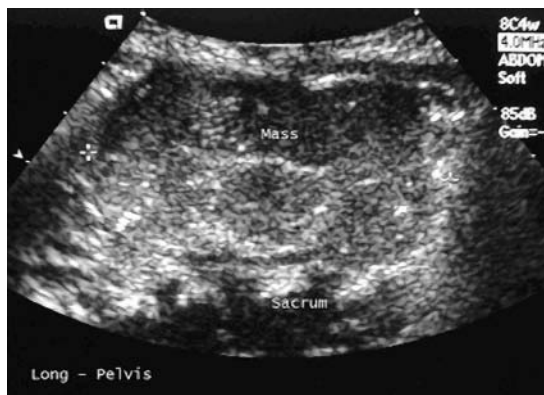
MASS POSTERIOR TO THE SACRAL SPINE

Sacroccocygeal teratoma
 Myelomeningocele (spinal dysraphism
 with banana and lemon signs)



PRESACRAL SOFT TISSUE MASS

Sacroccocygeal teratoma
Anterior myelomenigocele
Chordoma



CHEST

CYSTIC MASS IN THE CHEST

CCAM I or II
 Diaphragmatic hernia
 Bronchopulmonary foregut malformation,
 e.g., bronchogenic cyst, esophageal duplication
 Teratoma

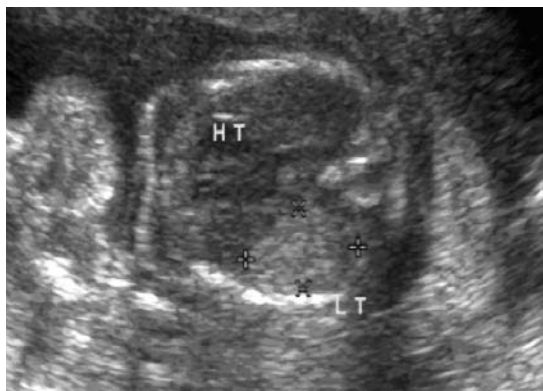


SOLID MASS IN THE CHEST

Pulmonary sequestration

CCAM III

Morgagni diaphragmatic hernia (liver herniation)



PLEURAL EFFUSION

Hydrops—bilateral

Chylous—unilateral



ABDOMEN

ANTERIOR ABDOMINAL WALL DEFECT

Normal prior to 12 wk

Omphalocele—covered by membrane; associated with structural and chromosomal anomalies

Gastroschisis—free-floating bowel; no associated anomalies

Bladder or cloacal extrophy = omphalocele, imperforate anus, myelomeningocele

Amniotic bands

Pentalogy of Cantrell—ectopia cordis; omphalocele

Limb-body wall complex—neural tube defect, limb anomalies, short straight umbilical cord

Beckwith-Wiedemann = omphalocele, macroglossia, visceromegaly



CALCIFICATIONS IN ABDOMEN

Meconium peritonitis

TORCH

Calcified teratoma

Echogenic bowel (no shadowing)



MECONIUM PERITONITIS—CALCIFICATIONS; CALCIFIED PSEUDOCYST

Normal

Distal obstruction

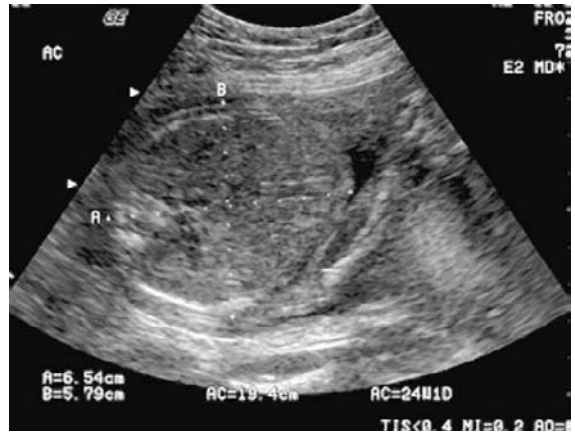
—atresia, volvulus, polyhydramnios

Cystic fibrosis—meconium ileus



ABSENT STOMACH BUBBLE

Esophageal .
Diaphragmatic hernia
CNS anomaly causing absence
of swallowing
Oligohydramnios



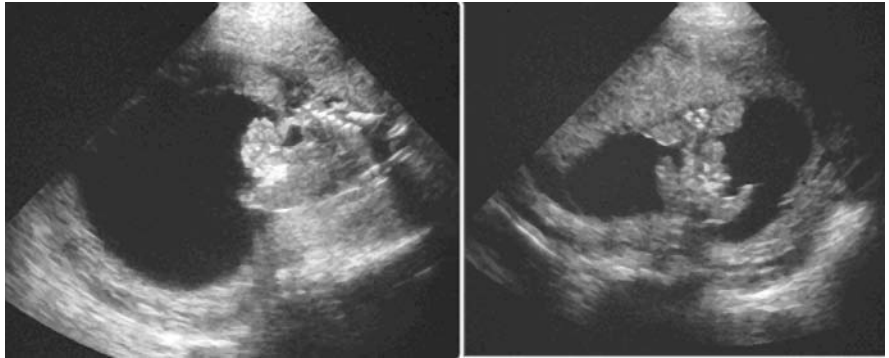
DOUBLE BUBBLE

Duodenal atresia—Trisomy 21
Annular pancreas
Malrotation with midgut volvulus
Choledochal cyst



CYSTIC STRUCTURE IN ABDOMEN AND PELVIS WITH NORMAL STOMACH BUBBLE

Renal cysts, hydronephrosis, urinoma
Bladder
Bowel duplication
Ovarian cyst
Mesenteric cyst
Urachal cyst
Teratoma



LIVER

CALCIFICATIONS IN LIVER

Incidental

TORCH—esp. CMV or Toxoplasmosis



BOWEL

ECHOGENIC BOWEL: FOLLOW-UP IMAGING RECOMMENDED

Cystic fibrosis
 Chromosomal—Trisomy 21
 CMV
 Intragut bleed



FETAL ASCITES

FLUIDS:

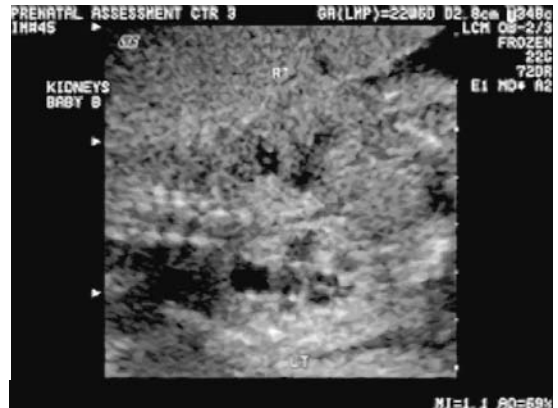
Blood—hemoperitoneum
 Urine—collecting system
 Bowel—meconium peritonitis
 General—hydrops
 Serous fluid—ruptured ovarian cyst



KIDNEYS

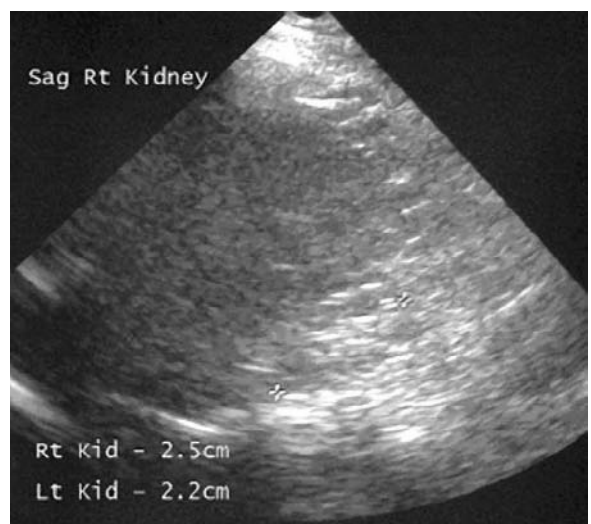
RENAL CYSTIC STRUCTURES

Multicystic dysplastic kidney
Severe hydronephrosis



ECHOGENIC KIDNEYS

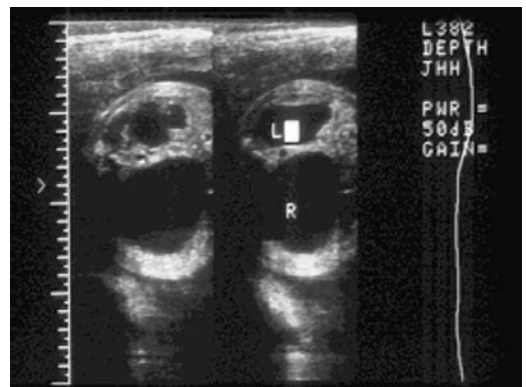
Small—obstructive renal dysplasia



Large—APCKD, Meckel-Gruber

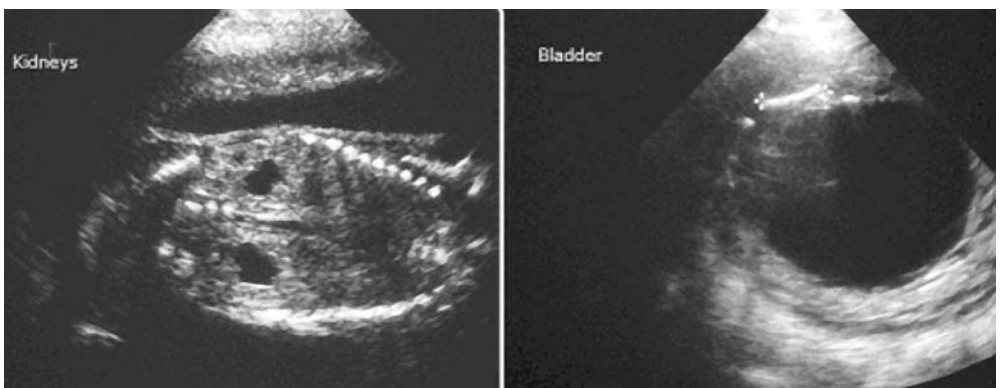


Bilateral hydronephrosis
 Posterior urethral valves
 Reflux
 Bilateral UPJ or UVJ



DILATED COLLECTING SYSTEMS AND BLADDER

Obstruction, e.g., posterior urethral valves
 Prune belly
 Megacystitis microcolon hypoperistalsis intestinalis—polyhydramnios and intestinal obstruction



LIMBS

ABSENT RADIAL RAY

VATER
 Trisomy 18
 Fanconi's anemia
 Holt-Oram syndrome—cardiac anomalies
 Amniotic bands



POLYDACTYLY

Familial
 Trisomy 13
 Meckel Gruber—encephalocele, polycystic kidneys



SHORT LIMBS

Trisomy 21

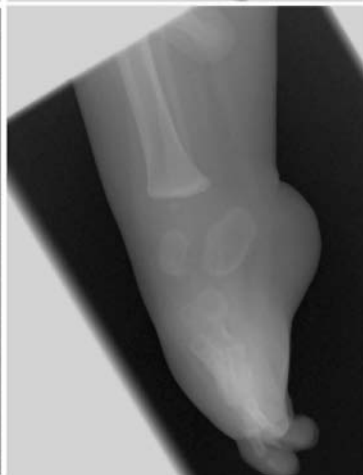
Dwarfs—thanatophoric dwarf, achondrogenesis

Amniotic bands—asymmetric shortening



CLUBFOOT

Idiopathic
Oligohydramnios
Trisomy 18
Amniotic bands



PLACENTA + CORD

TWO-VESSEL CORD

Renal anomalies
Cardiac anomalies
Trisomies 13 & 18



PLACENTA AT MARGIN OF INTERNAL CERVICAL OS

Marginal previa
Full bladder
Normal until 36 wk



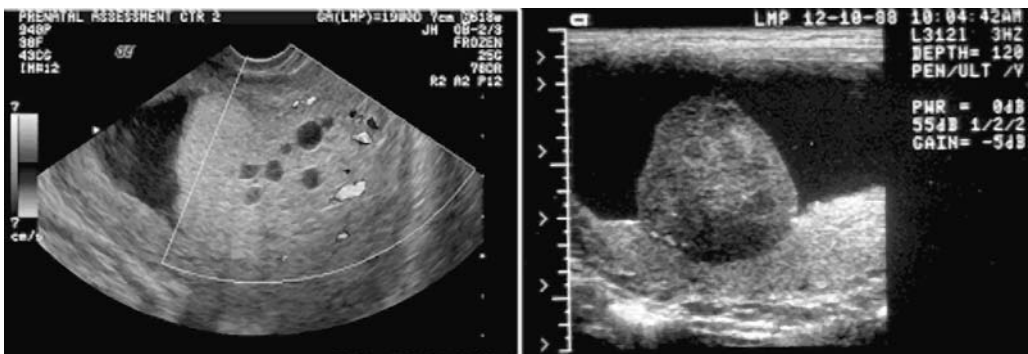
RETROPLACENTAL COLLECTION

Placental abruption
Vascular complex
Uterine contraction
Fibroid



PLACENTAL MASS

Chorangioma
Uterine contraction—NO FLOW
Fibroid—NO FLOW
Mole
Hydrops
Infection
Abruption



HETEROGENEOUS MASS CONTIGUOUS WITH PLACENTA; FETUS PRESENT

Partial mole
 Partial hydropic placenta
 Loculated placental abruption
 Chorioangioma



UTERUS + OVARIES + OTHER

MYOMETRIAL MASS DURING PREGNANCY

- Uterine contraction
- Fibroid
- Cornual ectopic pregnancy
- Extrauterine mass—adnexal, ovaries, bowel



MULTICYSTIC ENLARGED OVARY = THECA LUTEAL CYSTS

Gestational trophoblastic disease

Twins

Rh incompatibility

**TWO SACS IN FIRST TRIMESTER**

Twins (vanishing twin)

Subchorionic hematoma

Implantation bleed

Necrotic fibroid



MEMBRANE ACROSS GESTATIONAL SAC DURING SECOND AND THIRD TRIMESTER

Twins

Amniotic sheet

Circumvallate placenta



OLIGOHYDRAMNIOS

DRIPS

Demise
Renal
IUGR
PROM
PoStdates



POLYHYDRAMNIOS

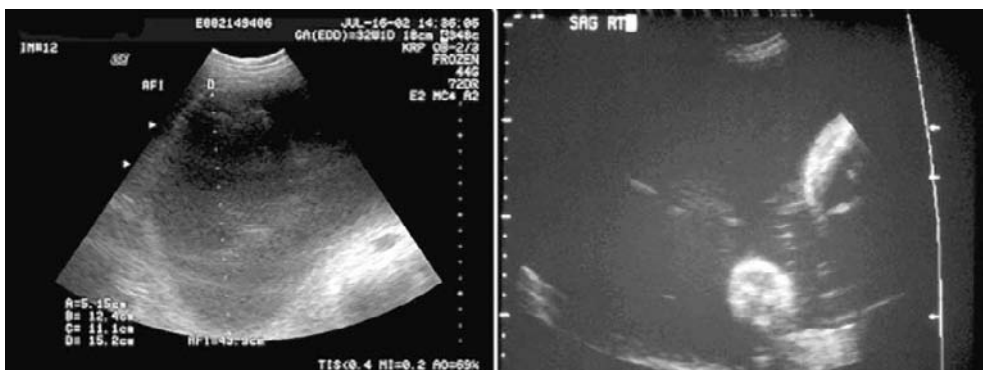
TARDI

Twins

Anomalies (fetal): esophageal atresia, duodenal/proximal small bowel obstruction, omphalocele, non-immune hydrops, anencephaly, hydranencephaly, holoprosen cephal, myelomeningocele, ventriculomegaly, agenesis of CC, encephalocele, microcephaly, diaphragmatic hernia, CCAM, tracheal atresia, extralobar sequestration, trisomy (13,18,21)

Rh incompatibility

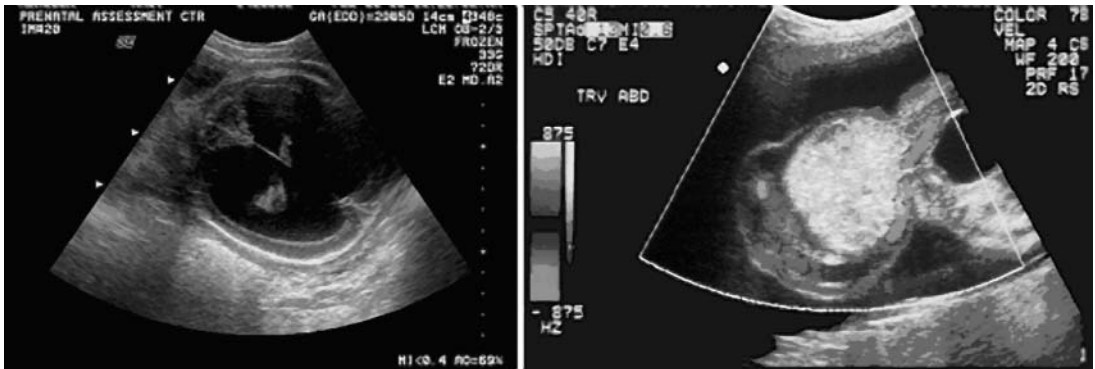
Idiopathic (60%)—associated with macrosomia



CHROMOSOMAL ABNORMALITY SYNDROMES

TRISOMY 13

CNS—holoprosencephaly, facial clefts
GI/GU—omphalocele, renal cystic dysplasia
MSK—polydactyly



TRISOMY 18

CNS—microcephaly, choroid plexus cysts, micrognathia, brachycephaly

GI/GU—omphalocele, diaphragmatic hernia

MSK—club foot, absent radial ray, clenched hands

Other—early symmetric IUGR, cord cyst



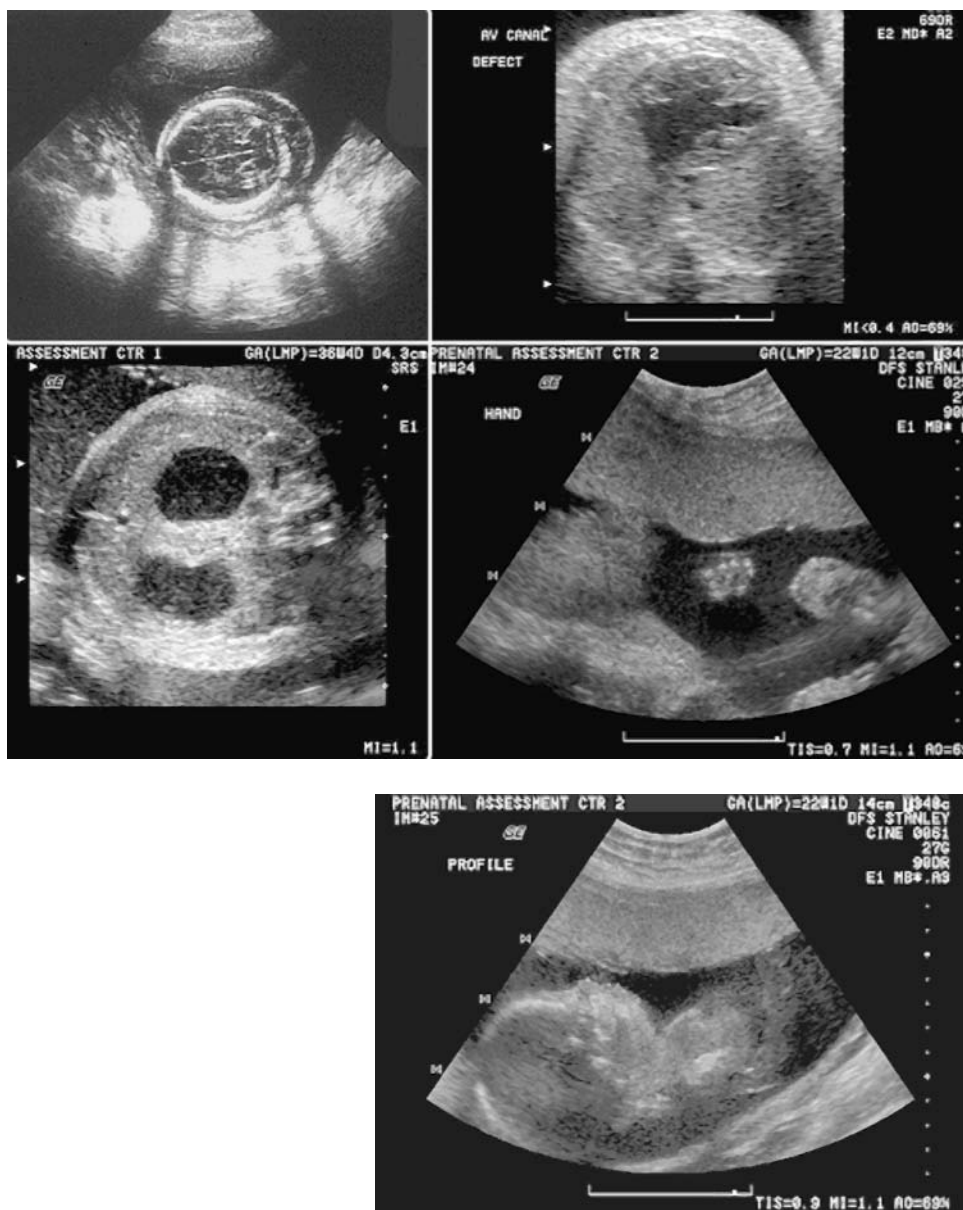
TRISOMY 21

CNS—nuchal fold thickening, cystic hygroma

Cardiac—endocardial cushion defect, echogenic intracardiac focus

GI/GU—duodenal atresia, echogenic bowel, renal pelviectasis

MSK—short femur and humerus, widened iliac angle, clinodactyly fifth finger

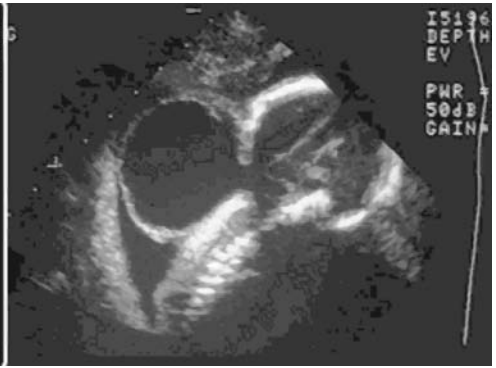
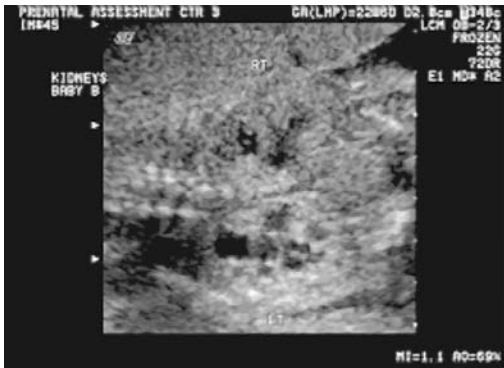


MECKEL GRUBER

Cystic kidneys = ARPKD

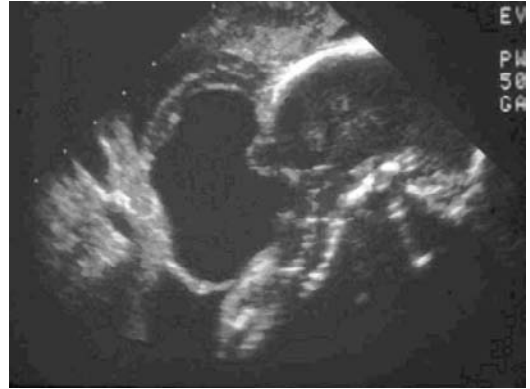
Encephalocele

Polydactyly



TURNER'S

Cystic hygroma
Nuchal fold thickening
Coarctation of aorta



TRIPLOIDY

Asymmetric IUGR (large head, small body)

Molar placenta

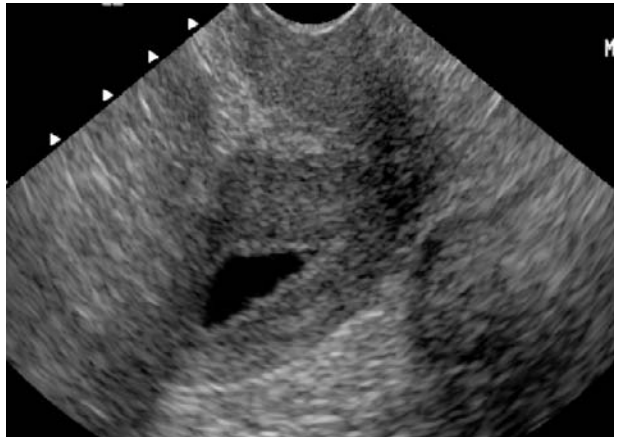


GYNECOLOGICAL ULTRASOUND

Uterus

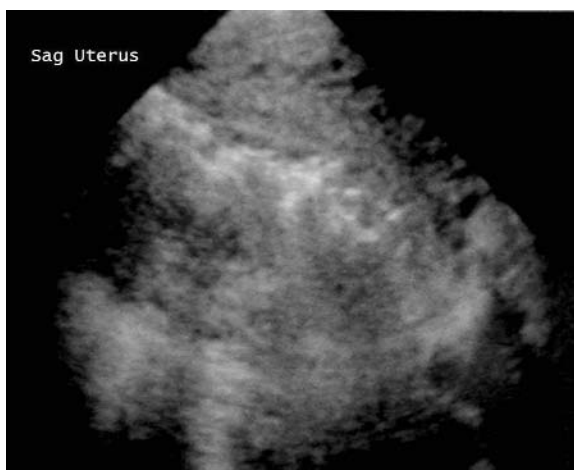
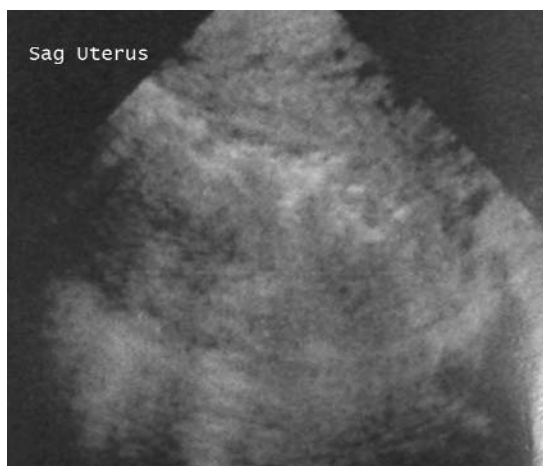
INTRAUTERINE COLLECTION

- Retained products of conception—premenopausal
- Pseudogestational sac—+ β HCG
- Cervical stenosis—postmenopausal
- Cervical carcinoma—postmenopausal
- Endometrial carcinoma—postmenopausal



GAS IN THE ENDOMETRIAL CAVITY

Endometritis with pyometria
Normal up to 4 wk postpartum



MULTIPLE SMALL HYPOECHOIC MASSES IN THE MYOMETRIUM

Adenomyosis

Multiple fibroids





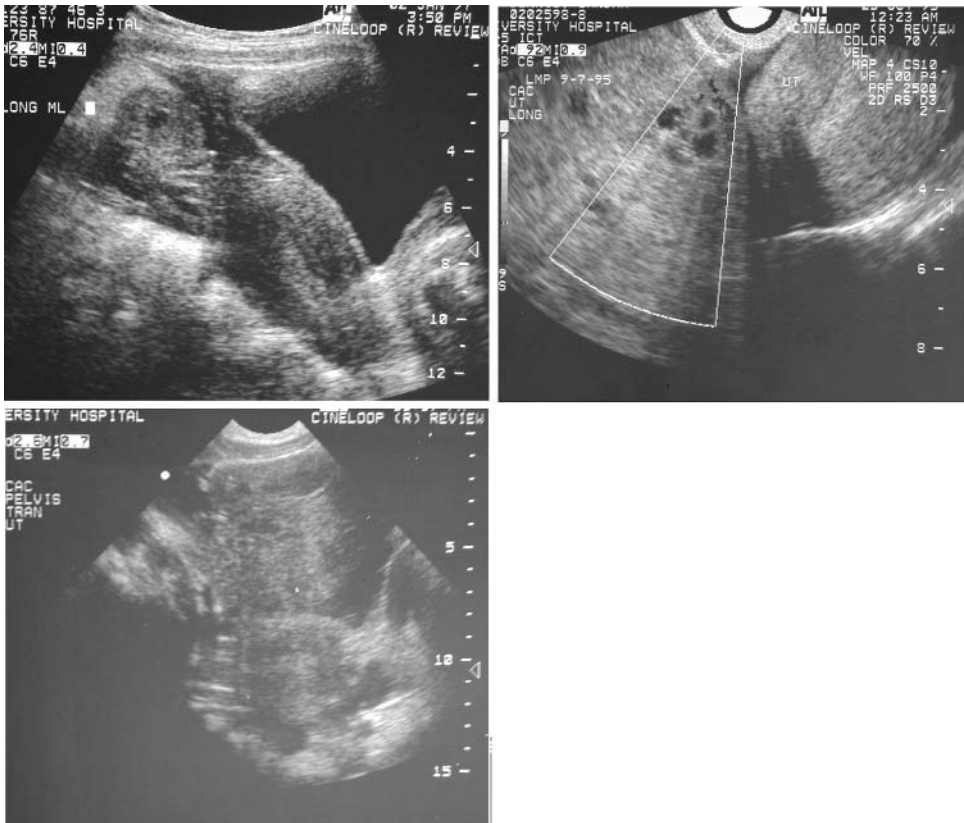
EXTRAUTERINE COMPLEX CYSTIC MASS—DDX DEPENDS ON HISTORY, AGE, ASYMPTOMATIC, PAIN, FEVER, TRAUMA

- Hemorrhagic cyst—resolve when rescan in 6 wk
- Endometrioma
- Teratoma
- Ovarian carcinoma—more likely in postmenopausal
- Ovarian torsion—pain
- Tubo-ovarian abscess
- Bowel abscess—appendicitis, diverticulitis
- Hematoma—posttraumatic



EXTRAUTERINE SOLID MASS

- Pedunculated fibroid
- Endometrioma and hemorrhagic cyst
- Teratoma
- Ovarian torsion—pain
- Fibrothecoma—ovarian
- Dysgerminoma—ovarian
- Ovarian metastasis, e.g., Krukenberg's tumor

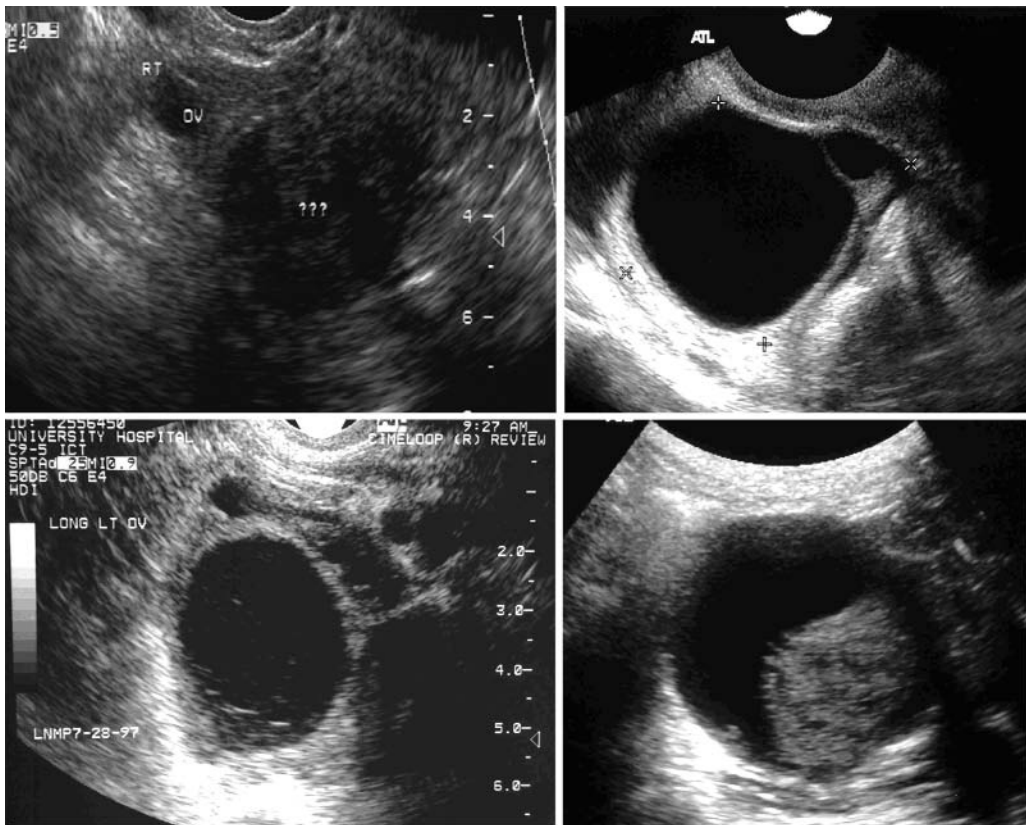


OVARY

OVARIAN MASS

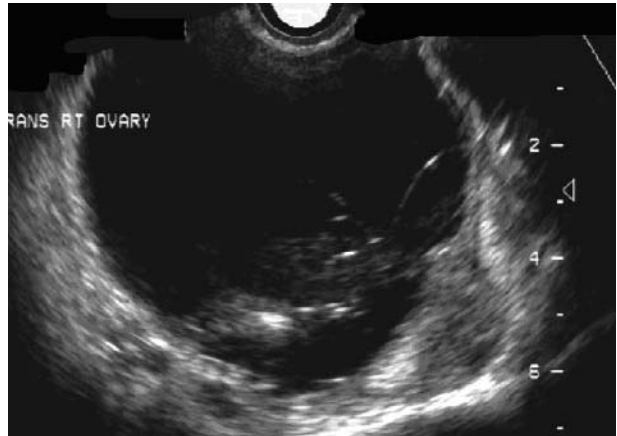
CHEETAH

Cyst
Hemorrhagic
Endometrioma
Epidermoid/Dermoid
Torsion
Abscess



VERY LARGE CYSTIC MASS WITH THIN SEPTATIONS

Ovarian neoplasm either benign (young) or malignant (old)
Loculated ascites—previous surgery or hemoperitoneum
Lymphangioma—previous surgery



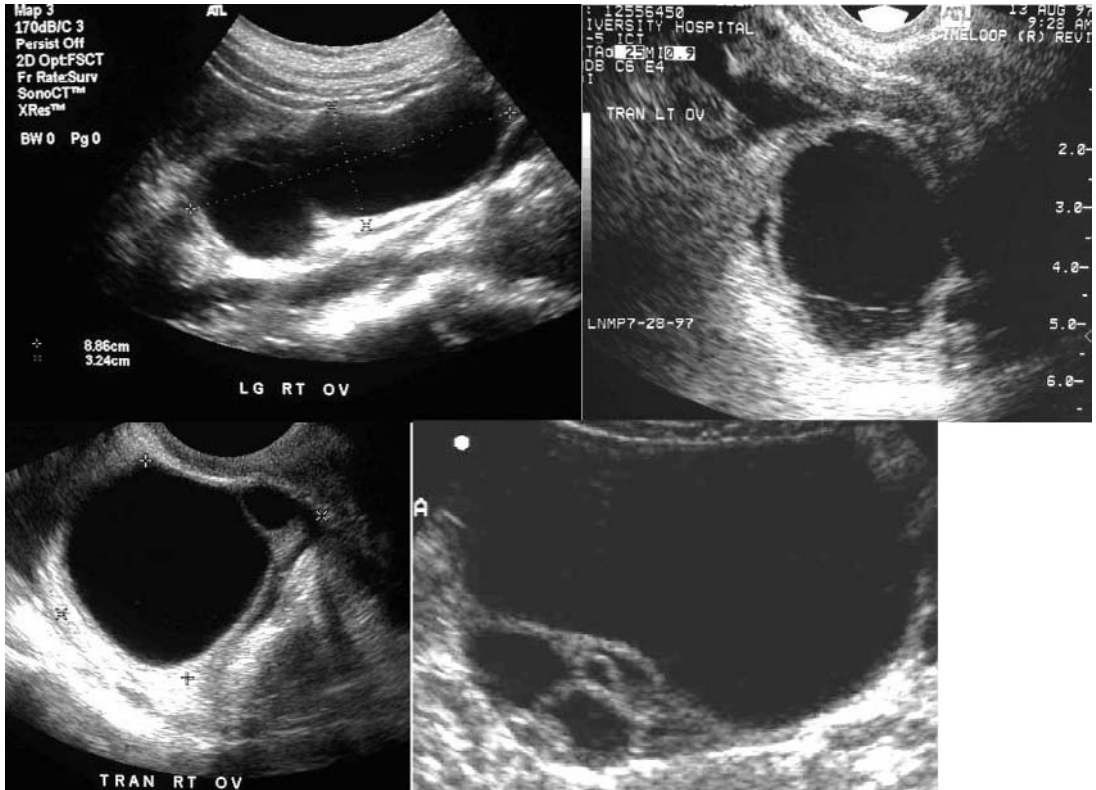
MULTICYSTIC ENLARGED OVARY

Ovarian neoplasms—cystadenoma or cystadenocarcinoma

Ovarian torsion (pain)

Theca lutean cyst—+ β HCG (bilateral)

Ovarian hyperstimulation—on Clomid (bilateral)



CALCIFIED PELVIC MASS

Fibroid

Dermoid

Ovarian neoplasm



ACUTE LOWER ABDOMEN

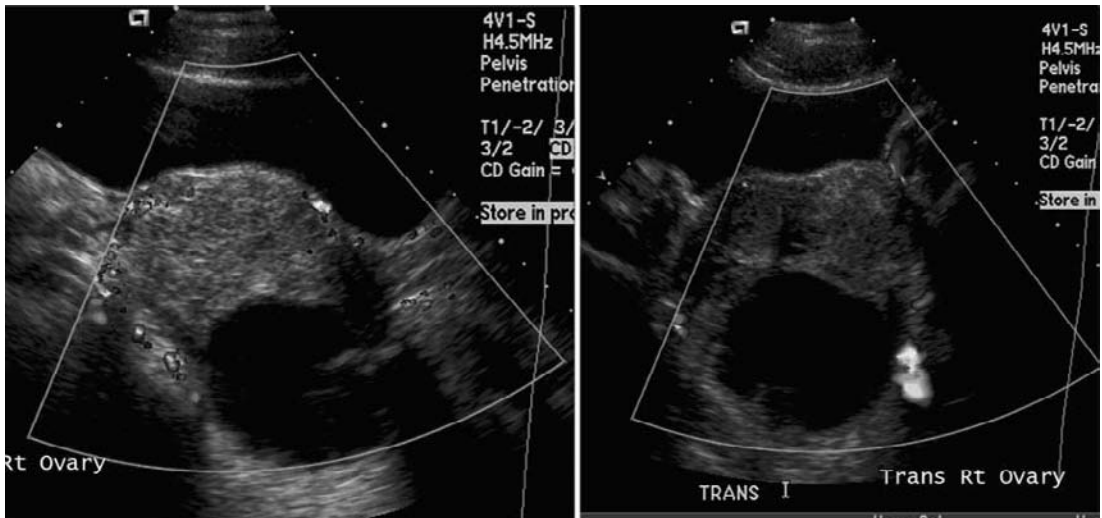
Torsion

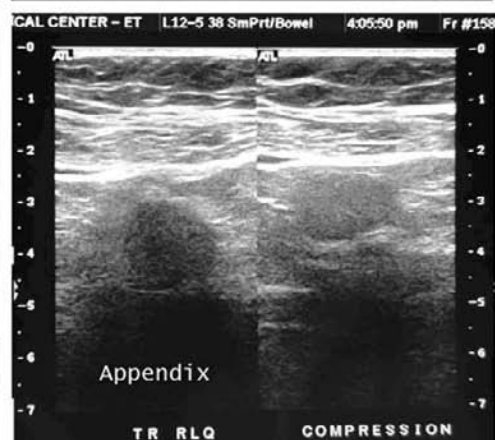
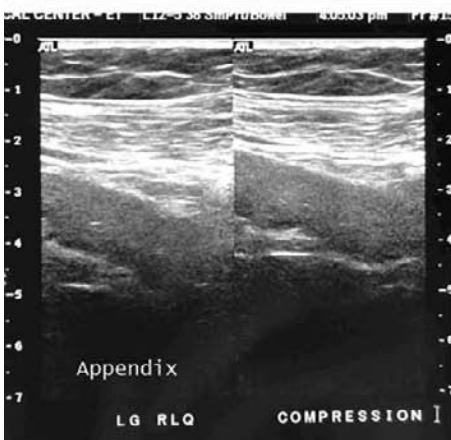
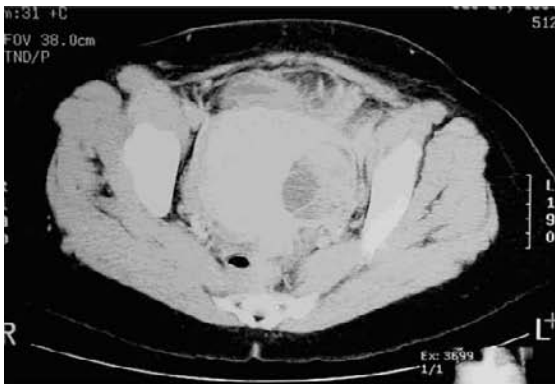
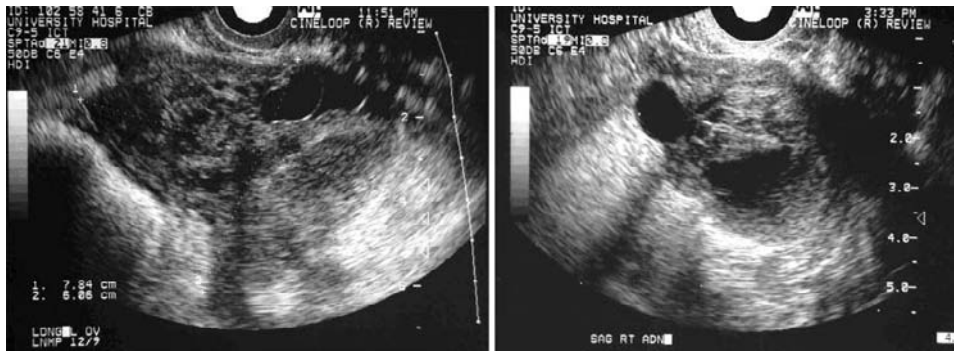
Hemorrhage into ovarian cyst or endometrioma

Abscess—tuboovarian or bowel

Red degeneration of fibroid (during pregnancy)

Appendicitis



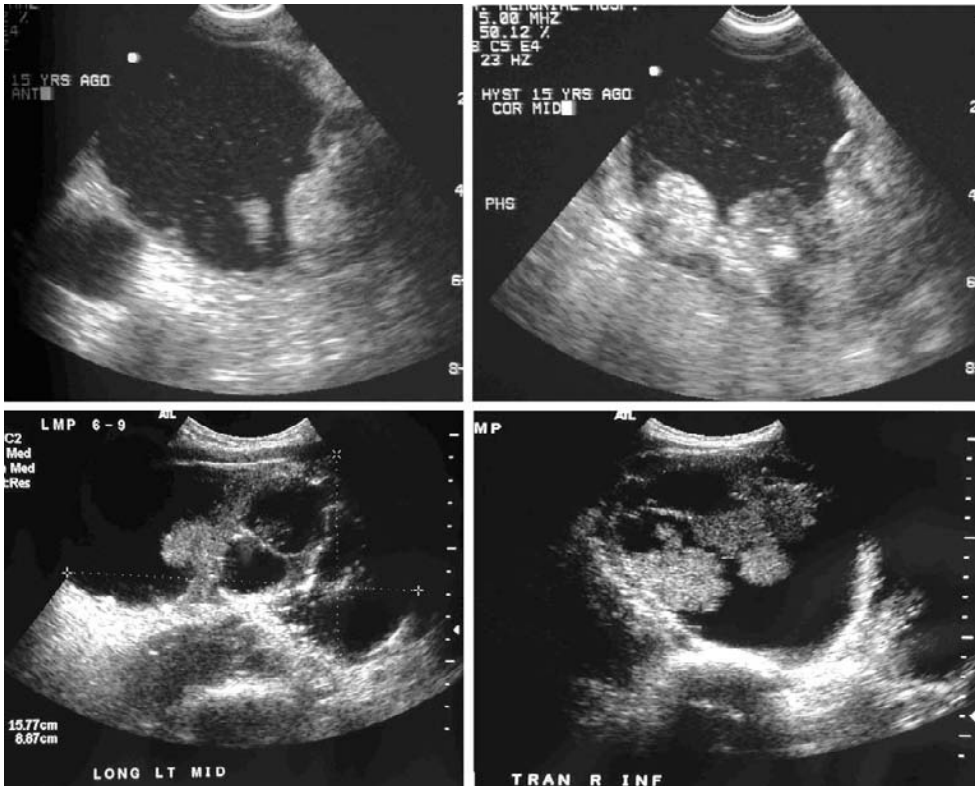


ASCITES WITH INTRAPERITONEAL IMPLANTS

Ovarian carcinoma

Colon, pancreatic or stomach carcinoma

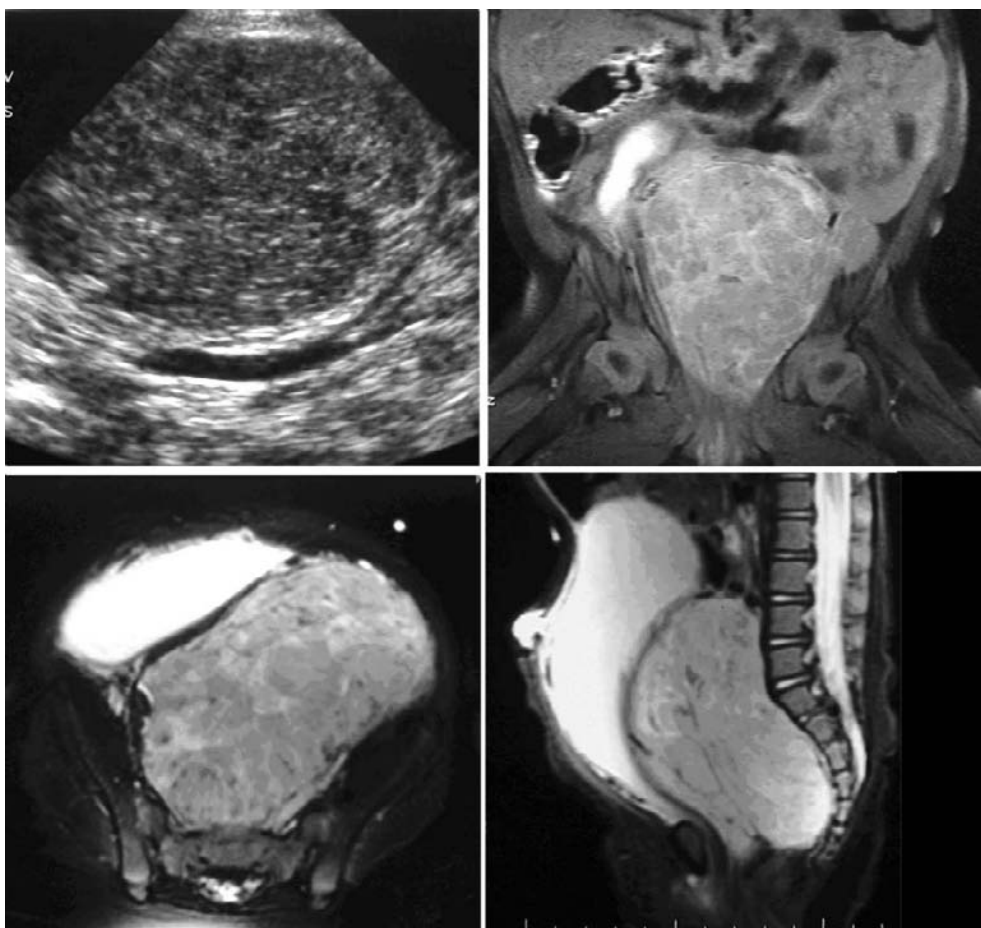
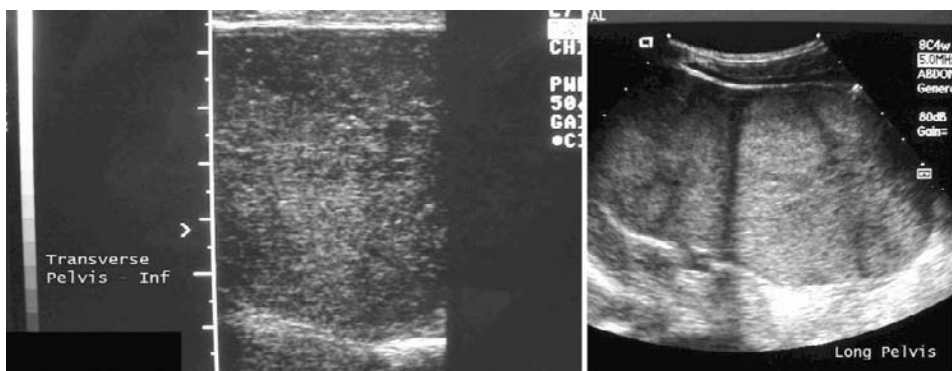
TB



PEDIATRIC ULTRASOUND

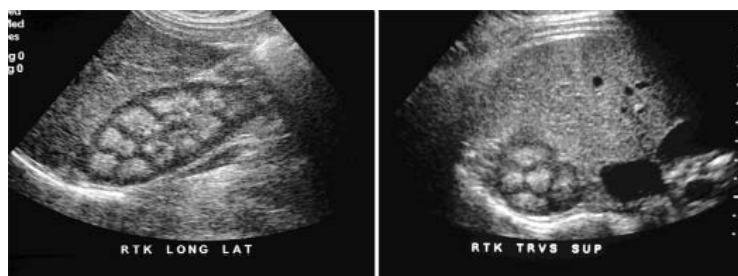
CHILD WITH SOLID PELVIC MASS

- Lymphoma
- Malignant germ cell tumor—dysgerminoma
- Sarcoma—bladder or vagina
- Neuroblastoma



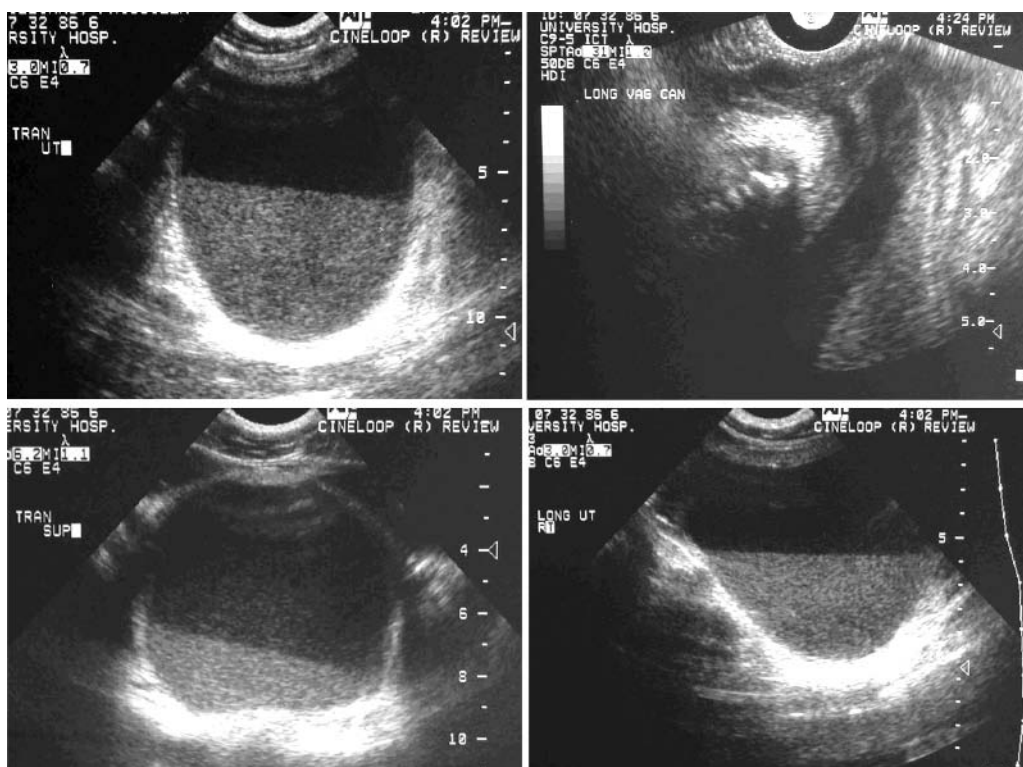
MEDULLARY NEPHROCALCINOSIS

Lasix
Renal tubular acidosis
Tamm Horsfall proteins—rapidly resolve



PELVIC FLUID COLLECTION IN PREMENSES GIRL

Hematometra—cevidal dysgenesis, vaginal agenesis
Hematocolpos—imperforate hymen, transverse vaginal septum



DOPPLER ULTRASOUND

DISCUSSIONS SHOULD INCLUDE:

1. Pulse (velocity)
2. Color (direction)
3. Power (flow)

VARIABLES INCLUDE:

1. Doppler gain
2. Doppler scale
3. Wall filters
4. Color gain
5. Color scale
6. Color priority

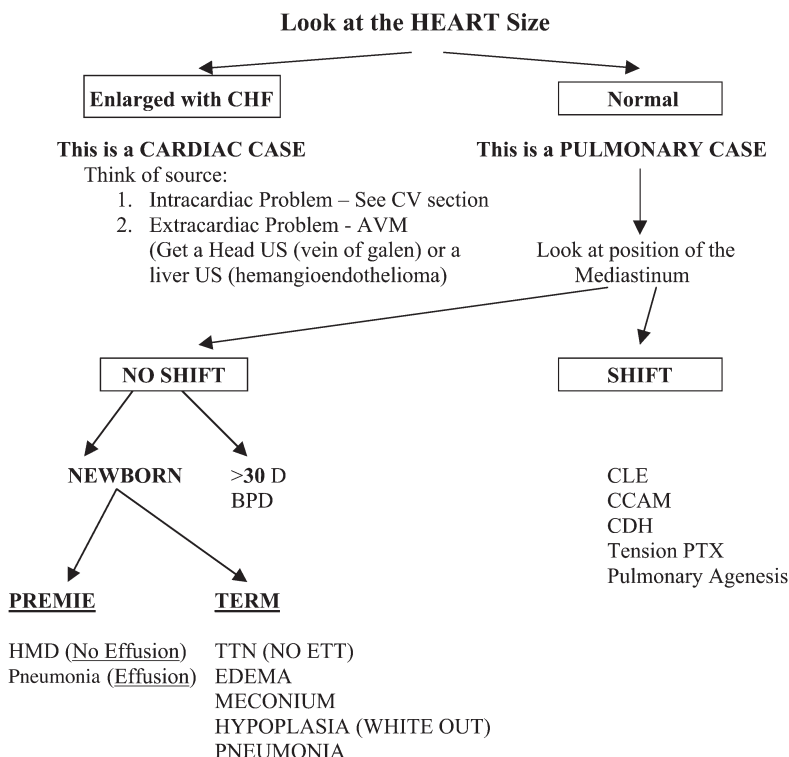
9

Pediatrics

Includes imaging procedures for the diagnosis of diseases in infants and children, such as plain film radiography, contrast medium studies, ultrasound, nuclear radiology, computed tomography, digital radiography, angiography, interventional techniques, magnetic resonance imaging, and congenital heart disease.

Chest

APPROACH TO THE PEDIATRIC CHEST XRAY



From: *Radiology: The Oral Boards Primer*
By: A. Mehta and D. P. Beall © Humana Press Inc., Totowa, NJ

EDEMA

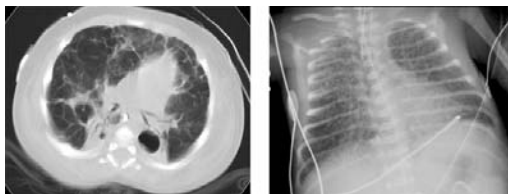


EITHER:

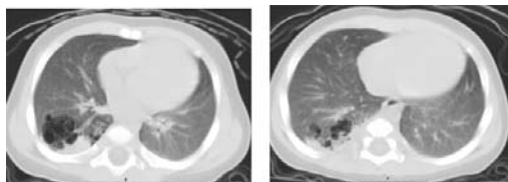
1. CLE



2. BPD

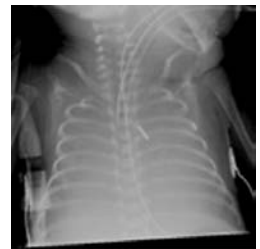
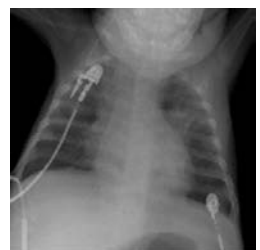


3. CAM



4. CDH



TENSION PTX**PULMONARY AGENESIS/HYPOPLASIA WHITE OUT****HMD (LLV NO EFF)****TTN (NO ETT)****PNEUMONIA (EFFUSION)**

EDEMA (OBST)**MECONIUM****BELL-SHAPED THORAX**

Lung Hypoplasia

Abn Muscle/Bone—Dysplasia, Syndrome (JEUNE)

Nervous System—Tri 21, Paralysis

**UPPER AIRWAY**

Hemangioma

Tracheitis (membranous croup)





Retropharyngeal abscess



Epiglottitis



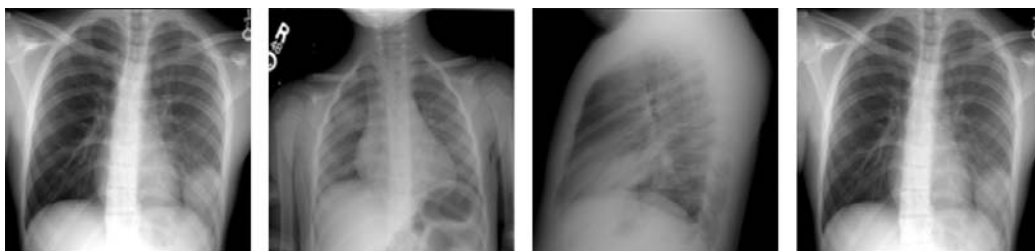
Croup



PULMONARY MASS

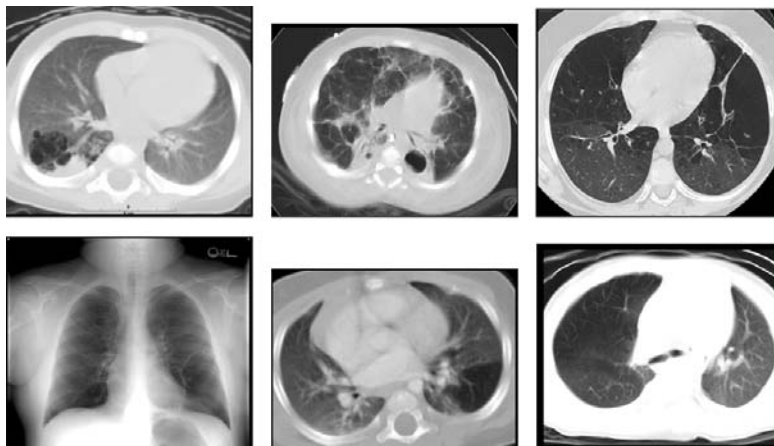
RAP'N FOREGUT

Round pneumonia
Abscess
Pseudotumor
Neoplasm (RARE) hamartoma, blastoma
Foregut malformations



BRONCHOPULMONARY FOREGUT MALFORMATIONS

Congenital lobar emphysema
 CCAM
 Sequestration
 Bronchogenic cyst



CHEST WALL MASS

RENAL Mets

Rhabdomyosarcoma

Ewings

Neuroblastoma

Askin tumor/PNET

Lymphoma

Mets



GI/GU

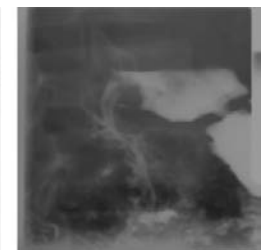
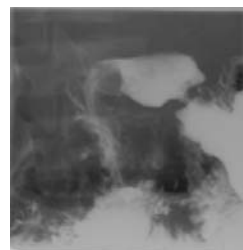
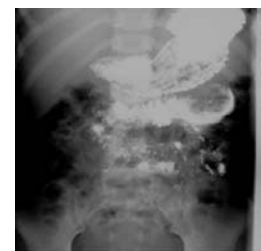
STOMACH

HPS
Spasm
Antral web



DUODENUM

Annular pancreas
Hematoma
Preportal Duodenum
Duodenal Stenosis



DOUBLE BUBBLE

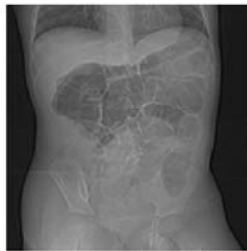
Duodenum
Annular pancreas
Volvulus
Ladd's bands



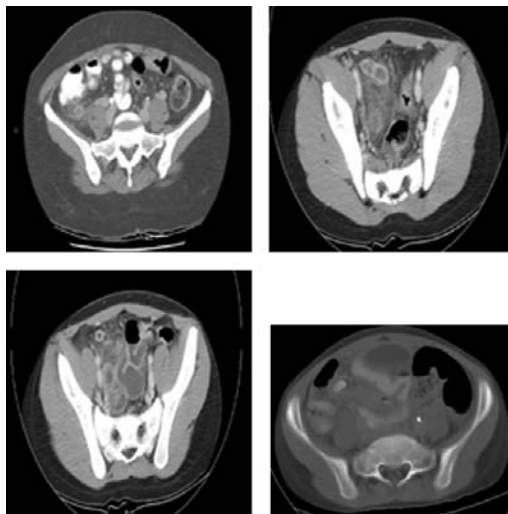
SMALL BOWEL OBSTRUCTION

AA II MM

Adhesion



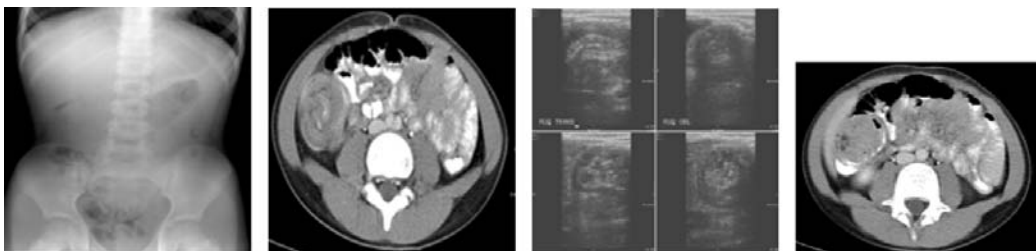
Appendicitis



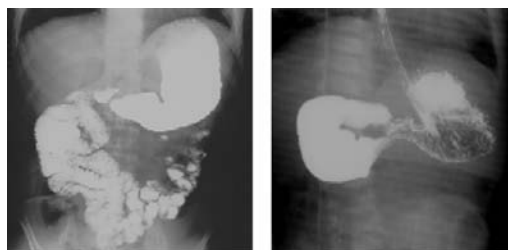
Inguinal Hernia



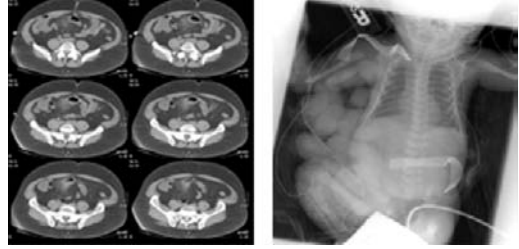
Intussusception



Malrotation with volvulus



Meckels/misc

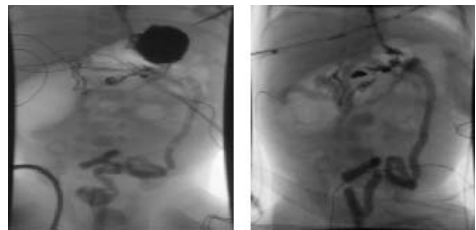


MICROCOLON

EVALUATE LEVEL OF DISEASE FROM LEVEL OF OBSTRUCTION:

RECTUM→SIGMOID→LEFT COLON→RIGHT COLON→TERMINAL ILEUM

Microcolon secondary to proximal atresia



Hirschsprungs (rectum)



Meconium plug/Small left colon syndrome (left colon)



Colonic atresia (entire colon)

Ileal Atresia (entire colon)

Meconium ileus

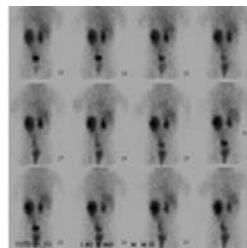
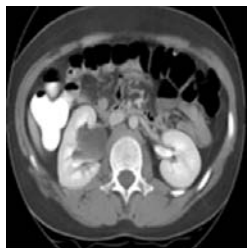
Jejunal atresia

MgSO₄

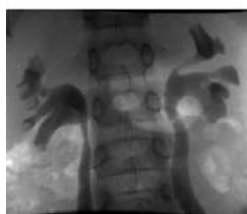
Infant of a diabetic mother

HYDRONEPHROSIS

UPJ



Reflux



Posterior urethral valves



Ectopic ureterocele
Prune belly



Primary megaureter
MCDK



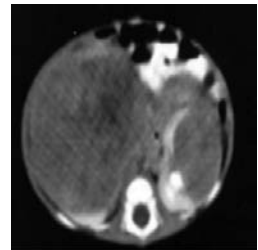
RENAL CYSTIC DISEASE

MCDK
 Juvenile nephronopthisis
 APCKD
 ARPKD
 Glomerulocystic disease
 Obstructive lesions
 NUCS CAN DIFFERENTIATE FCN/Non FCN



RENAL MASS

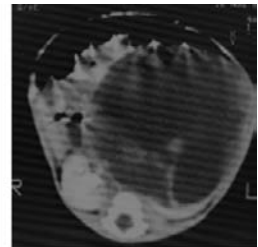
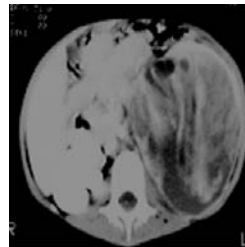
Wilms—(chest mets) (>1 yr)



Rhabdoid—(brain mets) (1 yr)



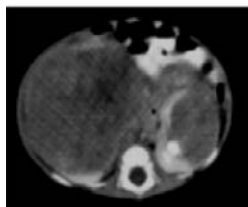
Clear cell sarcoma—(bone mets) (1 yr)
 Mesoblastic nephroma



Multilocular cystic nephroma
 RCC (>3 yr)
 Renal medullary carcinoma (sickle cell disease)
 Pyelonephritis

BILATERAL RENAL MASSES

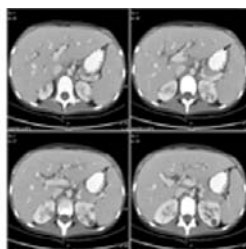
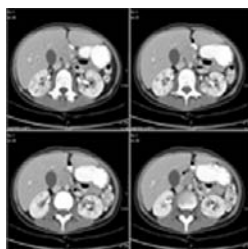
Nephroblastomatosis



Pyelonephritis



Lymphoma/mets

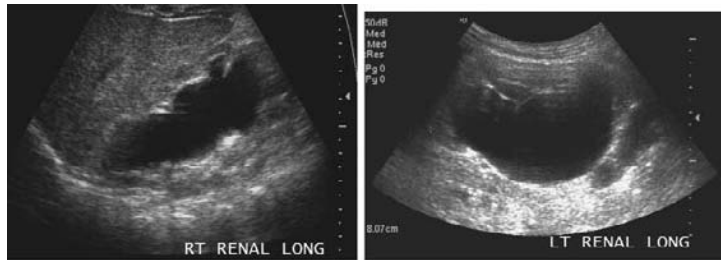


Infarcts
Cysts

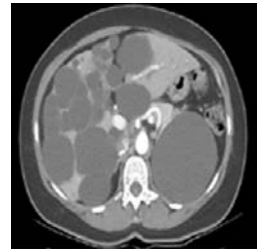


BILATERAL ENLARGED KIDNEYS

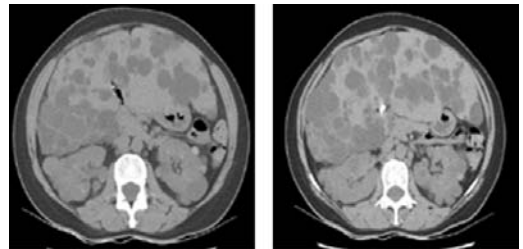
Bilateral hydronephrosis



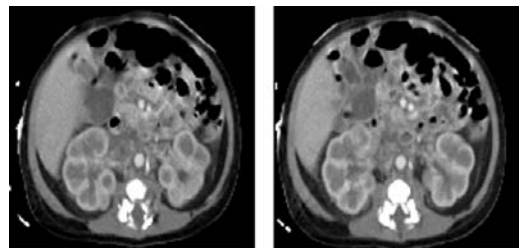
Glomerulonephritis
ARPKD



ADPKD



Bilateral renal vein thrombosis

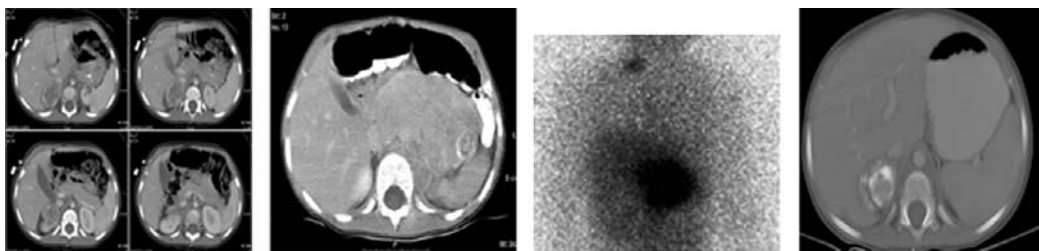


Nephroblastomatosis
Beckwith Weidemann

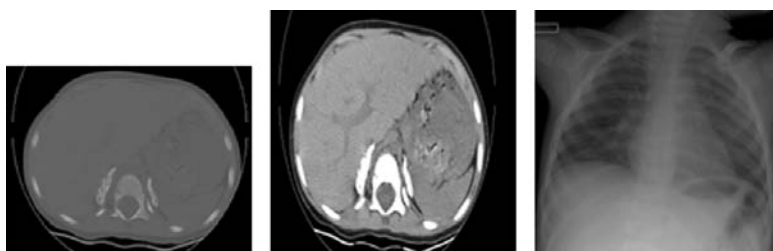
ADRENAL MASS

NAP

Neuroblastoma



Adrenal hemorrhage/Adrenal cortical carcinoma



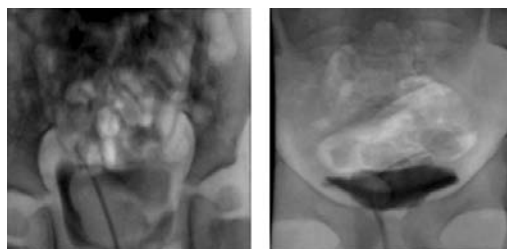
Pheochromocytoma

BLADDER MASS

FUR

Fibroepithelial polyp

Ureterocele



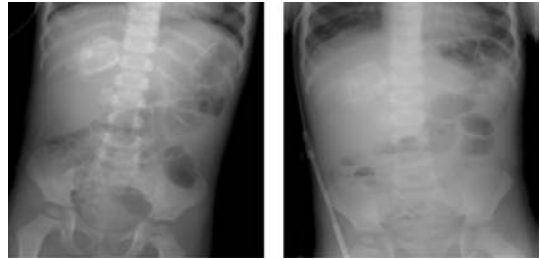
Rhabdomyosarcoma



ABDOMINAL CALCIFICATION

L-M-N

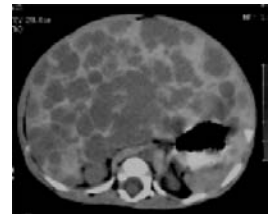
Liver
Meconium peritonitis
Neuroblastoma



LIVER MASS

NEWBORN

Infantile hemangioma (solid)

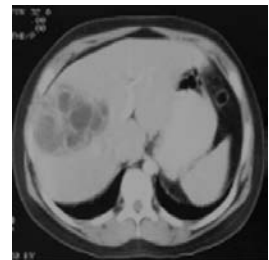


Hepatoblastoma (solid)
Embryonal cell sarcoma (mixed)



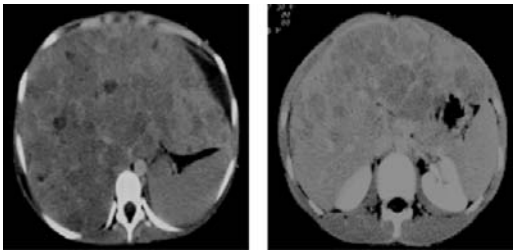
1 YR

Mesenchymal hamartoma (cystic)



>3 YR

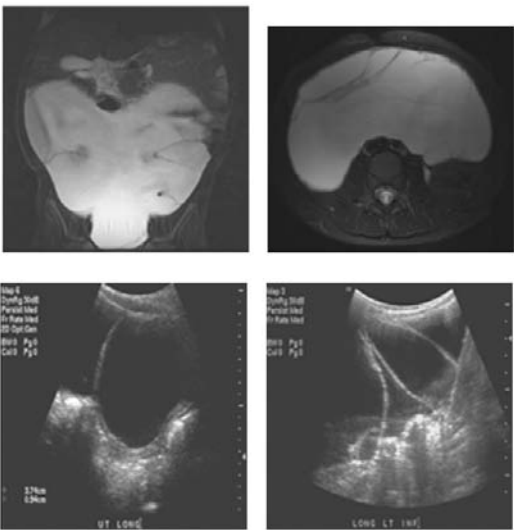
Hepatocellular carcinoma (variable)



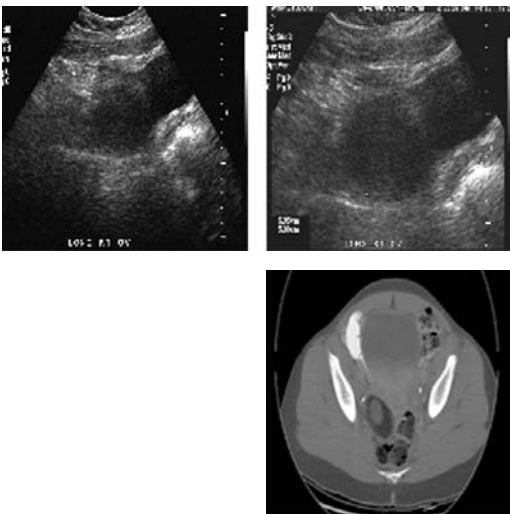
CYSTIC ABDOMINAL MASS

ECHO™

Enteric duplication
Choledochal cyst/mesenteric cyst
Hydrocolpos

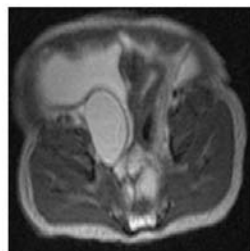
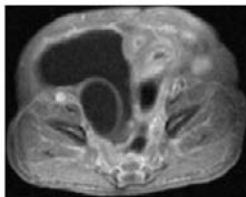


Ovarian cyst



Teratoma

Meconium pseudocyst

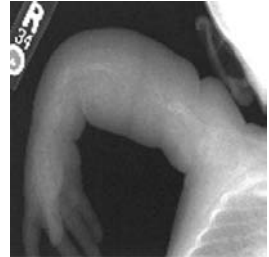


Musculoskeletal

MULTIPLE FRACTURES

SHOT

Scurvy
Hypophosphatasia
OI
Trauma



DIFFUSE PERIOSTEAL REACTION

SCALPR

Scurvy/infection
Caffey
Accidental trauma
Leukemia
PGE2
Rickets



ATLANTOAXIAL WIDENING

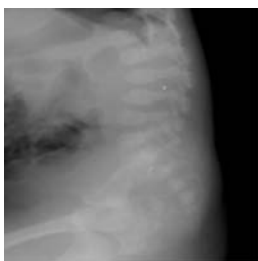
Downs
JRA
Morquio
Trauma



PLATYSPONDYLY

MODIC

Morquio
Osteogenesis imperfecta
Dwarf (thanatophoric)
Cushing's syndrome



POST VB SCALLOPING

SALMON

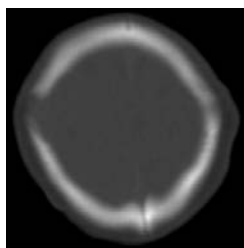
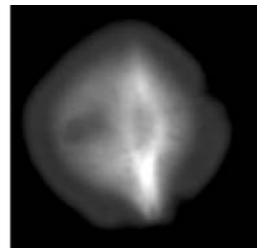
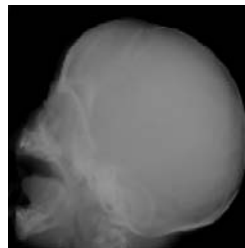
Spinal cord tumor
 Achondroplasia
 Mucopolysaccharidosis
 Osteogenesis imperfecta
 Neurofibromatosis



SKULL

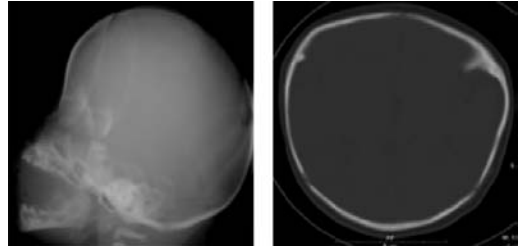
1. SCAPHOCEPHALY = DOLICOCEPHALY

Premature closure of sagittal suture (long skull)



2. BRACHYCEPHALY = TURRICEPHALY

Premature closure of coronal/lambdoid sutures (short tall skull)



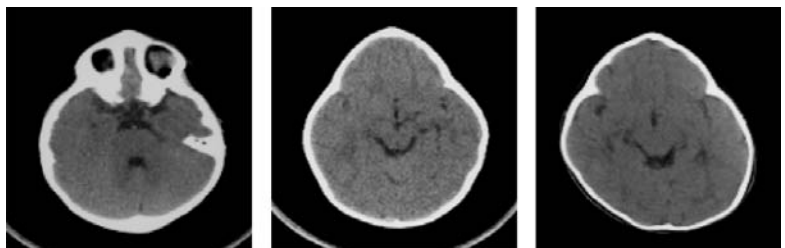
3. PLAGIOCEPHALY

Unilateral early fusion of coronal/lambdoid suture (lopsided skull)



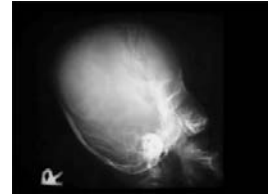
4. TRIGONOCEPHALY

Premature closure of metopic suture (forward pointing skull)



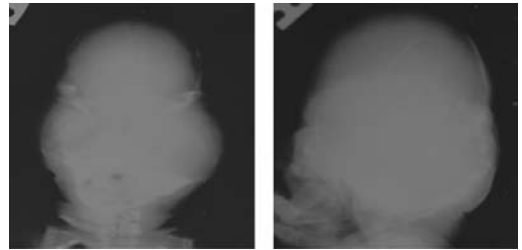
5. OXYCEPHALY

Premature closure of coronal, sagittal, lambdoid sutures



6. CLOVERLEAF SKULL = KLEEBLATTSCHÄDEL

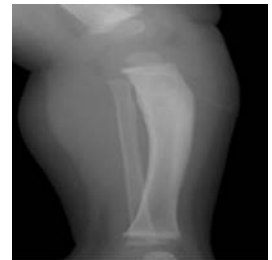
Intrauterine premature closure of sagittal, coronal, lambdoid sutures



TIBIAL BOWING

FONAR

Fibrous dysplasia
Osteogenesis imperfecta
Neurofibromatosis
Achondroplasia
Rickets



SACRAL MASS

KIDS WITH SACRAL MASSES RANT

Rectal duplication cyst
Anterior meningocele
Neuroblastoma
Teratoma



KNEE

POSSIBLE CASES:

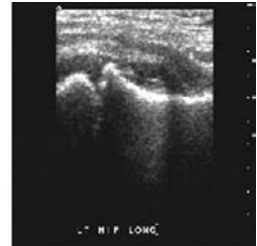
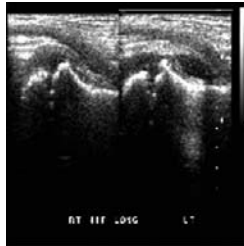
Trauma
JRA
Hemophilia
TB/infection
Trevor's disease



HIP

POSSIBLE CASES

Septic effusion
Toxic synovitis



Congenital dysplasia hip (neonate/infant)



Legg Calve Perthes (school age)



Slipped capital femoral epiphysis (adolescent)



FRAGMENTED EPIPHYSIS

TWILL

Trauma
Warfarin
Infection
Legg Calve Perthes
Leg dysplasia



RADIAL RAY

TAR
Holt Oram
Fanconi's anemia
Poland

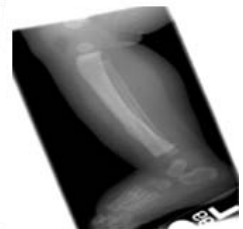
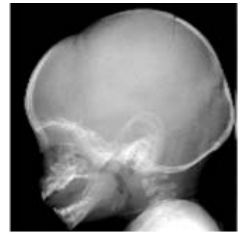


POLYDACTYLY

Familial

Trisomy 13

Lawrence-Moon-Bardet-Biedel

**ABUSE**

VIEWS:

AP/LAT Axial skeleton: skull, spine, sternum

AP: Appendicular skeleton

HIGH SPECIFICITY

Spinous process

Sternum

Scapula

Post Rib

INTERMEDIATE SPECIFICITY

Multiple fractures in various stages of healing

Hand/wrist injury

C-Spine

LOW SPECIFICITY

Midshaft fractures

Nonspiral fractures

10

BREAST

1. PARENCHYMAL PATTERN ASSESSMENT

1. The breast is almost entirely fat.
2. There are scattered fibroglandular densities.
3. The breast tissue is heterogeneously dense, which may lower sensitivity of mammography.
4. The breast tissue is extremely dense, which could obscure a lesion on mammography.

2. MASSES ASSESSMENT

ROLIA AND COMIS

Round
Oval
Lobulated
Irregular
Architectural distortion
Circumscribed
Obscured
Microlobulated
Indistinct
Spiculated

3. WORKUP NONPALP MASS

1. MAG VIEWS
2. **RO** (Round or Oval) 75% well circumscribed, not new, not palpable
—6 mo follow-up PB
3. Others:
—US—CYST
—Simple—STOP
—Complex—ASPIRATE

4. **LI** (lobulated or irregular) BX
5. **A**, Architect distortion
 - PRIOR SX? Yes—could be CA, scar, radial scar, overlap

If palp—same except US if negative mammo

Dec to bx if both negative—up to clinician

TRABECULAR THICKENING

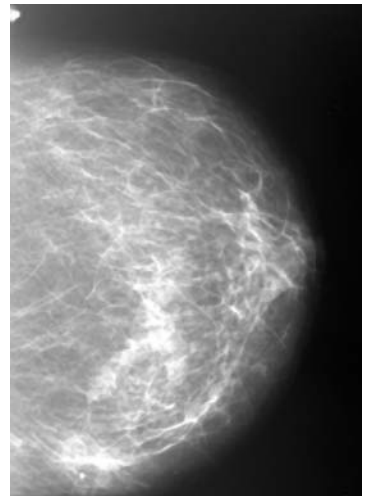
Inflammatory carcinoma

Mastitis

Radiation

Lymphadema/CHF

Punch BX



ARCHITECTURAL DISTORTION

Carcinoma

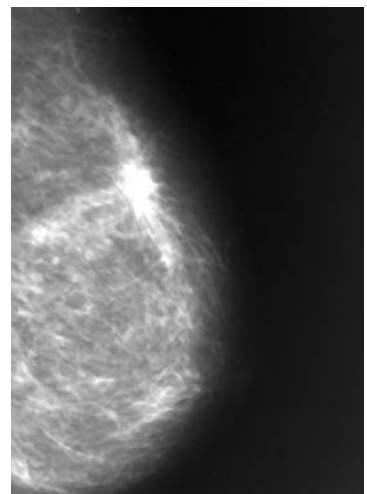
Radial scar

Post Sx

Fat necrosis

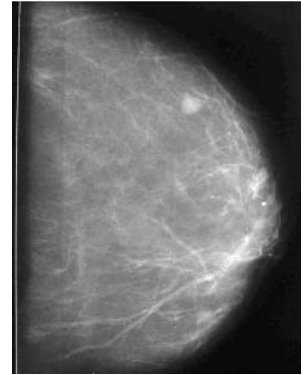
Abscess

? HX SURGERY



CIRCUMSCRIBED MASS

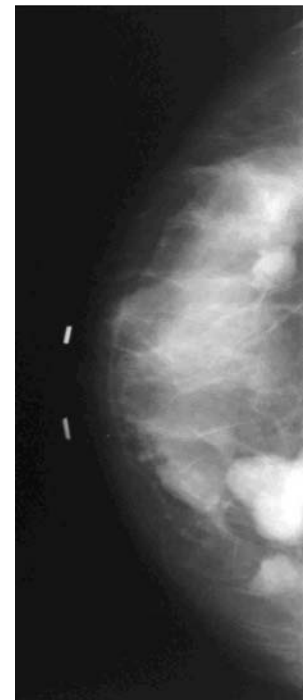
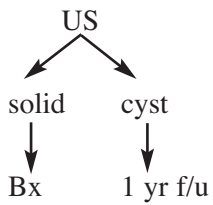
Cyst
Fibroadenoma
Cancer
Other—phylloid/met/hematoma



MULTIPLE MASSES

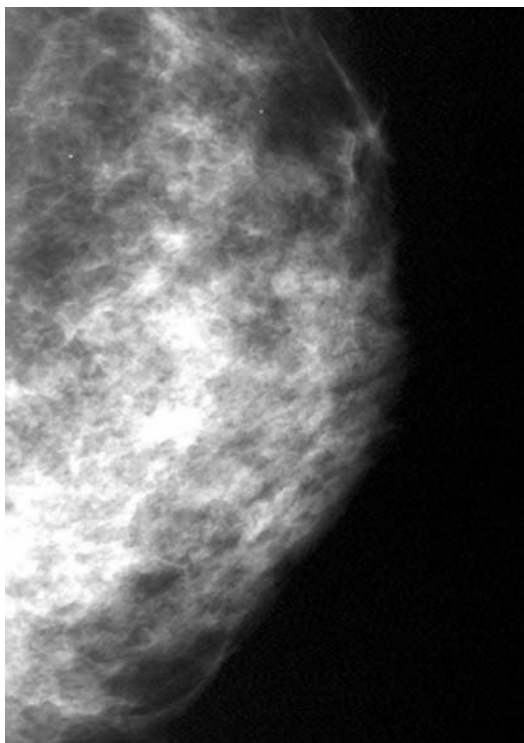
Cysts
Fibroadenomas
Mets—melanoma/lymphoma/lung

- No HX malig 1 yr follow-up
- Hx malig



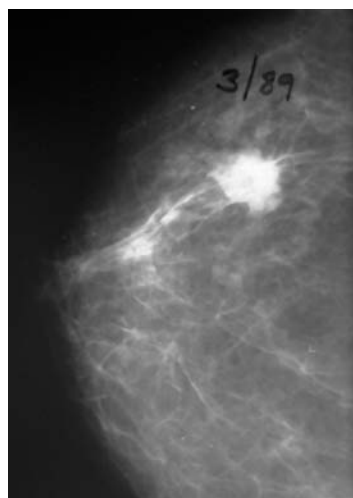
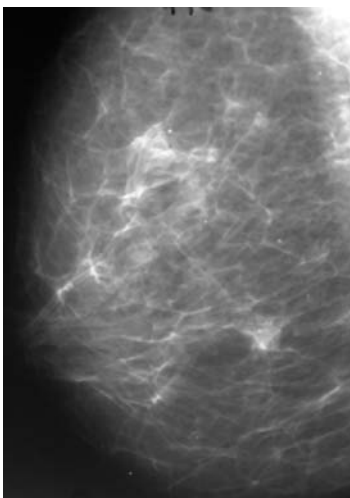
FAT CONTAINING LESION

Hamartoma
Galactocele
Lipoma
Oil cyst



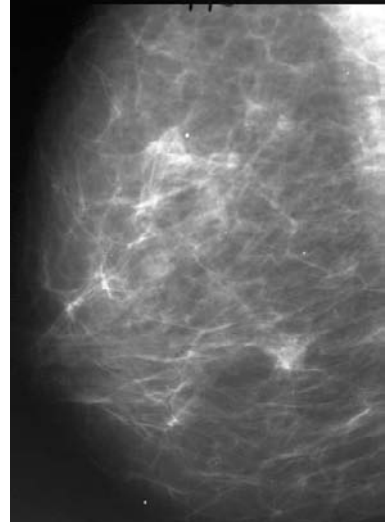
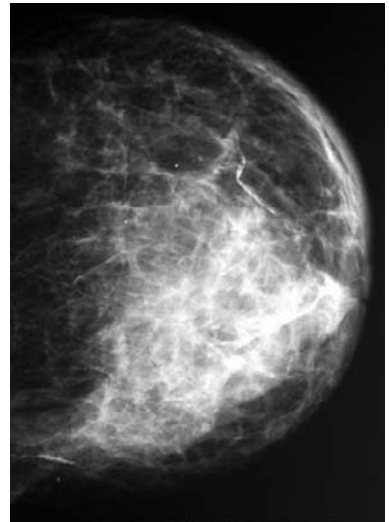
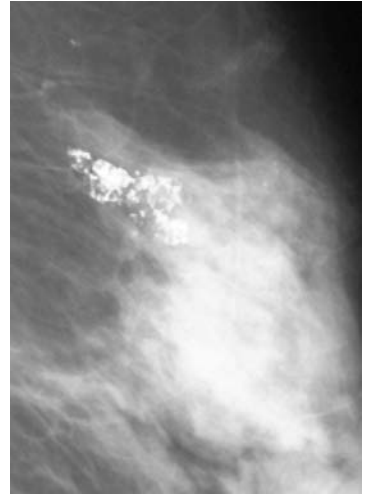
DEVELOPING DENSITY

Carcinoma
HRT
Lymphoma
Hematoma



CALCIFICATIONS

1. Identify
2. 90° VIEW to R/O MILK of calcium
3. BENIGN—STOP
 - a. Vascular
 - b. Popcorn
 - c. Large Rods
 - d. Lucent center
 - e. Eggshell
 - f. Suture
 - g. Dystrophic

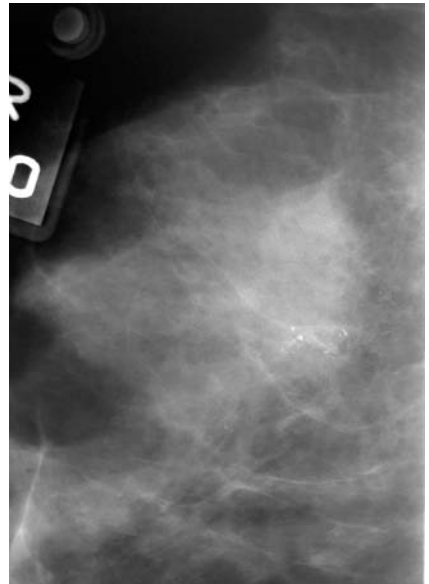


4. MALIGNANT—BX
5. Cluster round probably benign—6 mo follow-up



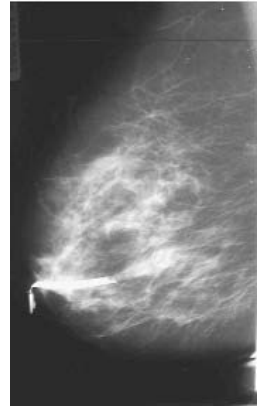
INDETERMINATE CALCS

DCIS
Fibrocystic change, Sclerosing adenosis
Fat necrosis



SPECIAL**TUBULAR DENSITY/DUCT**

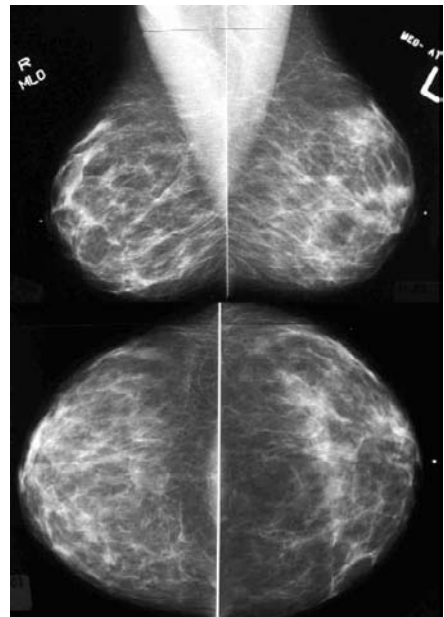
Nipple D/C → Serous/Bloody → US/Galactogram
Asymptomatic → STOP

**INTRAMAMMARY LYMPH NODE**

Lateral outer → Mag view fatty hilum → STOP

**ASYMMETRIC BREAST TISSUE**

1. No calc.
2. No mass.
3. No central density.
4. No distorted architecture.



FOCAL ASYMMETRIC DENSITY

? LOBULAR CARCINOMA

A. SIMILAR SHAPE ON TWO VIEWS.

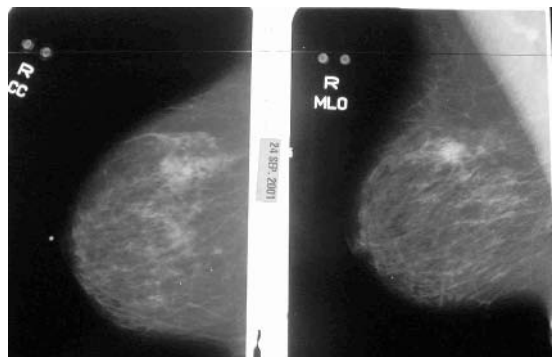
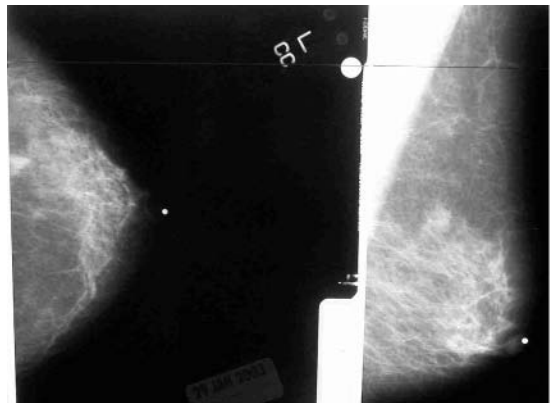
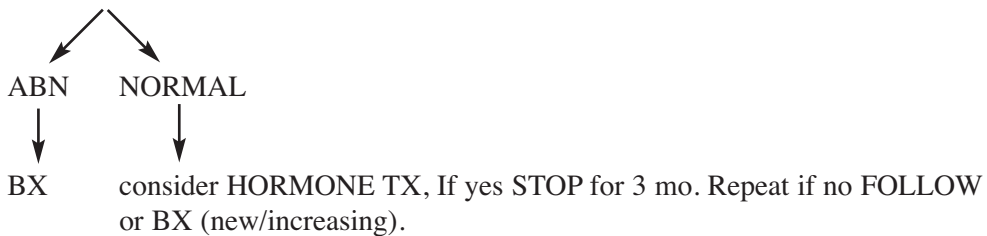
B. CANNOT BE DESCRIBED WITH “ROLIA” AND “COMIS” (see p. 305)

1. No borders, convex outward.
2. No conspicuity of a true mass, changes on two views.
3. Variable density.
4. Nonpalpable.

C. MAG-ISLAND OF NORMAL BREAST TISSUE WILL RESOLVE

If does not resolve.

D. ULTRASOUND



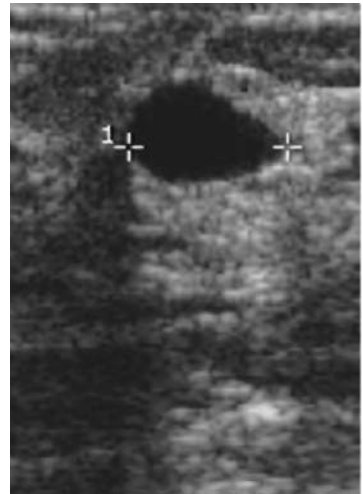
ULTRASOUND

1. Skin
2. Superficial Fascia—Superf and Deep
 - a. Fat b/w the skin and superfic
 - b. Coopers b/w two layers
3. Mammary Gland
4. Retromammary Space (post to deep layer of the superficial fascia)
5. Pec Major/minor
6. Rib

CYSTS

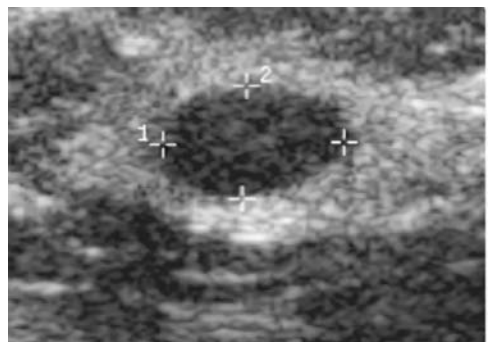
SIMPLE

1. Completely anechoic
2. Smooth walls
3. Sharp ant and post borders
4. Post-acoustic enhancement



COMPLEX

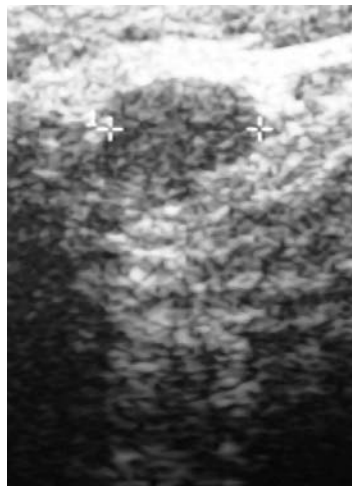
1. Abscess
2. Debris
3. Intracystic tumor (papilloma, papillary carcinoma)
4. Fat necrosis



MASSES

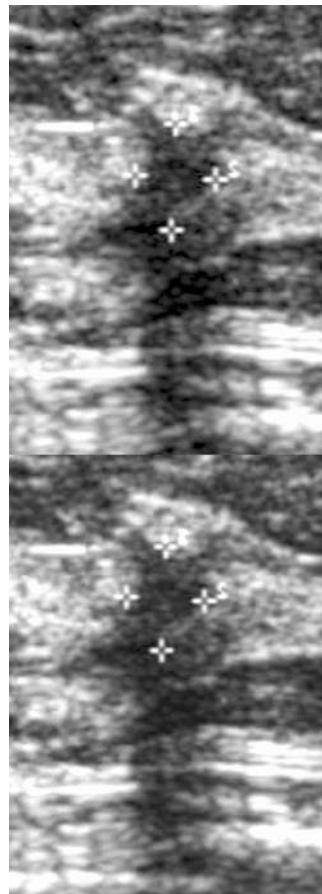
THRU TRANSMIT

1. Fibroadenoma
2. Medullary carcinoma
3. Papillary carcinoma
4. Metastatic lymphoma



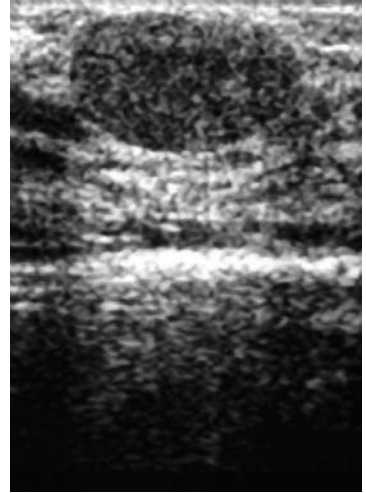
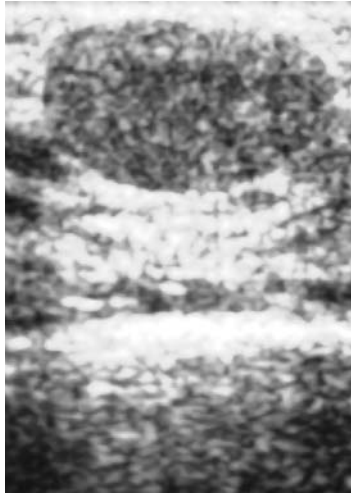
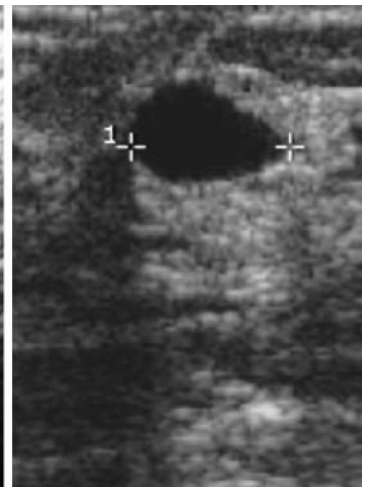
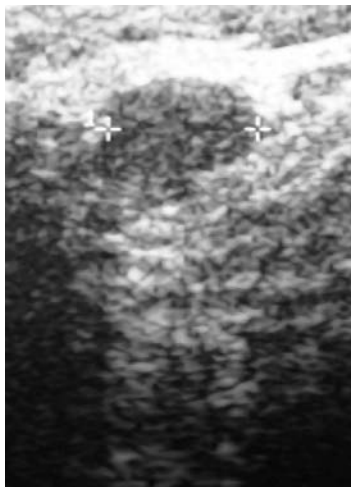
MALIGNANT MASS

1. Spiculation
2. Taller than wide
3. Angular margins
4. Hypoechoic to fat
5. Shadow
6. Duct extension
7. Microlobulation



BENIGN MASS

1. No malignant features
2. Intense, uniform echog
3. Ellipsoid plus capsule
4. Three or fewer gentle lobulations

**INDETERMINATE**

Stereotactic Biopsies**CONTRAINDICATIONS**

1. Breast doesn't compress
2. Cant get to lesion
3. Radial Scar/Arch distortion
4. Patient cannot lie prone

11

Neuroradiology

Includes plain film diagnosis of the skull, sinuses, mastoids, spine and head, and neck structures, and all other imaging and special procedures related to the central nervous system and head and neck including angiography, myelography, interventional techniques, and magnetic resonance imaging.

IN GENERAL, EVERY CASE WILL FALL INTO:

1. Tumor
2. Infarct (arterial or venous)
3. Infection
4. Vascular
5. Congenital
6. Inflammatory

EVERY CASE TO PREVENT FAILING THE SECTION:

1. IS IT VASCULAR?
2. IS THERE HERNIATION?

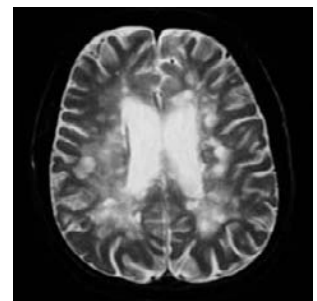
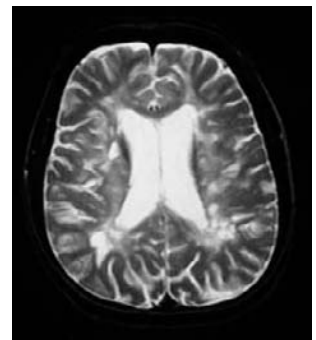
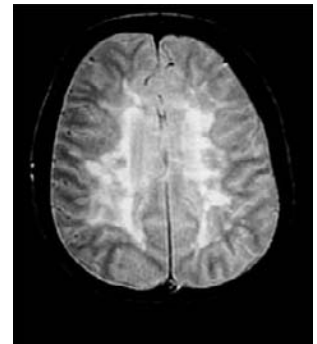
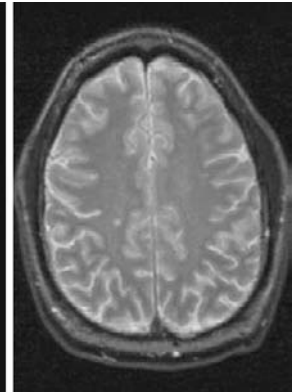
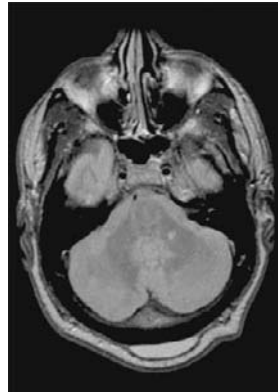
White Matter

DEMYELINATING

Cortical

LATE VIDEO

- Lymphoma
- ADEM
- Trauma
- Elderly-nonspecific periventricular
- Vasculitis
- Infections HIV/Herpes/PML
- Demyelinating
- Eclampsia
- Other—Radiation Tx



Brainstem

Central Pontine Myelinolysis



DYSMYELINATING

LACK OF Proper Myelination

Leigh (Leigh's **PUTATO** chips)

—**Putamen**, periventricular, subcortical

Adrenoleukodystrophy — Posterior

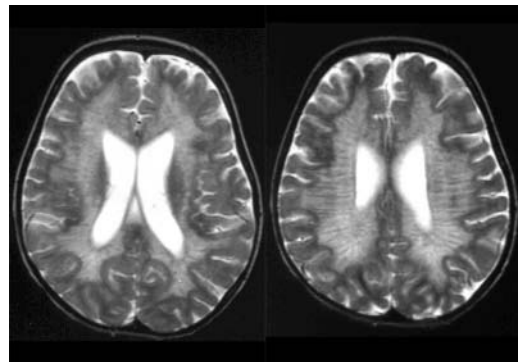
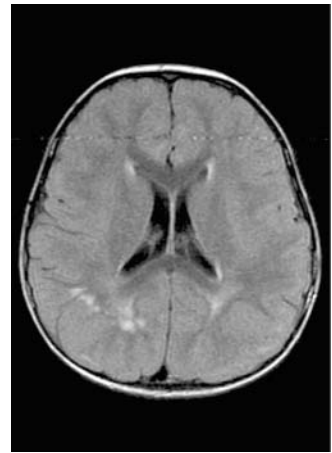
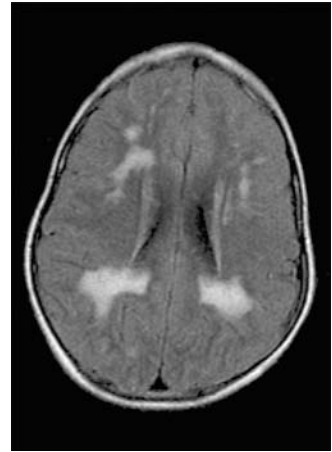
Alexander — Big head, Frontal

Canavan — Big Head, Subcortical

Krabbe — Thalami

Pelizeus Merzbacher — Diffuse

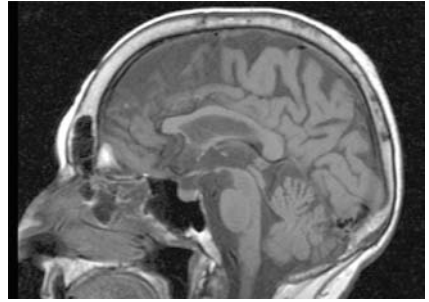
Metachromic Leuko — Cerebellar+BG



ATROPHY

CORTICAL

Senile dementia Alzheimer's type
Ischemic/Vascular
Picks



BASAL GANGLIA/OTHER

Parkinson's

MULTIPLE MASSES

MAILMAN

Metastasis
Angiomas—Vascular malformations
Infarction/infection
Lymphoma
Multiple sclerosis
Abscesses
NF spots (remember the esoteric diagnoses)



EXTRA AXIAL MASS

MAD SALE

Meningioma

Abscess

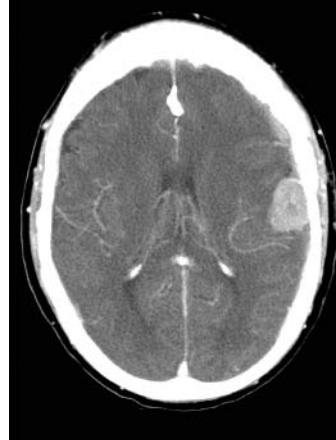
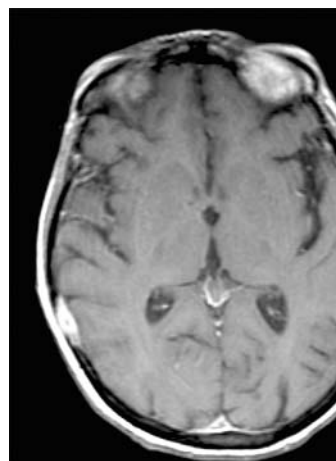
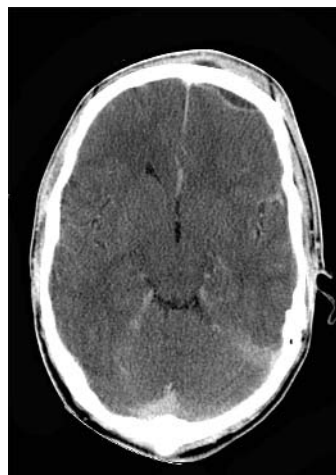
Dural metastasis — prostate/breast

Sarcoidosis

Abscess/AVM

Lymphoma

Epidermoid/dermoid

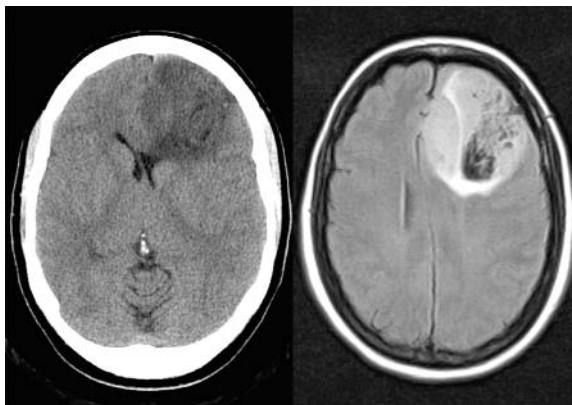
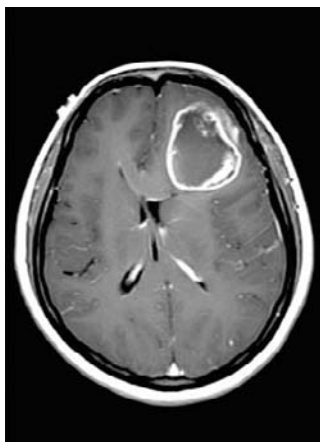
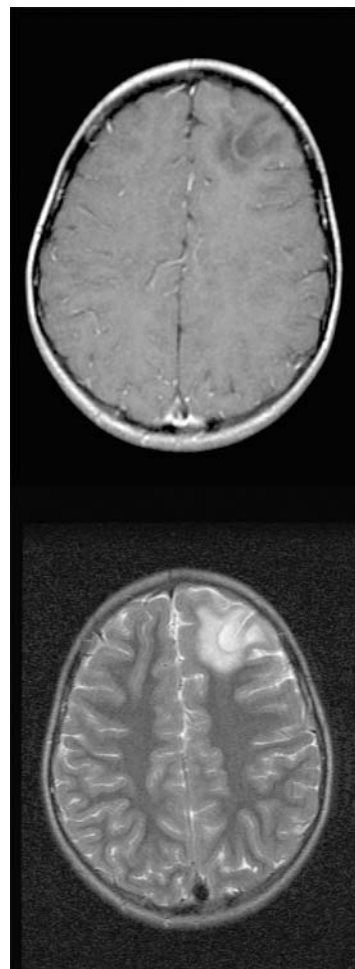


INTRA-AXIAL***Supratentorial*****CHILD****TAPE**

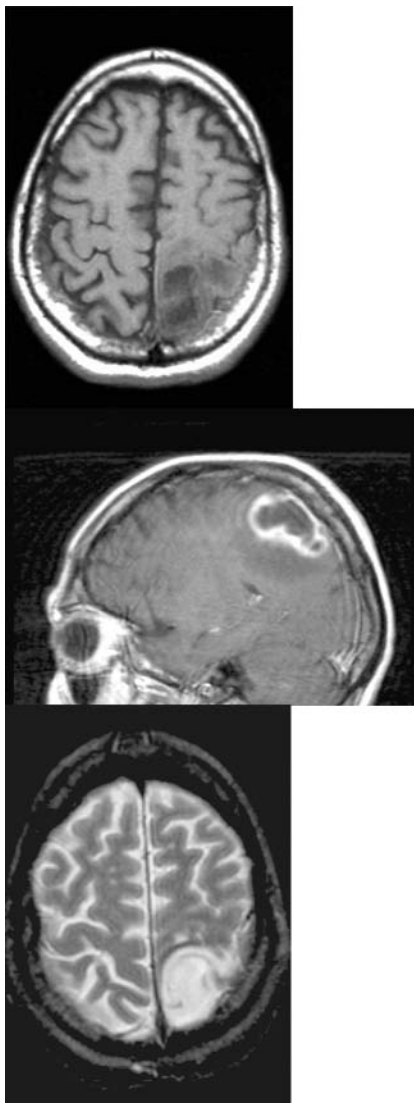
Teratoma
Astrocytoma
PNET
Ependymoma

ADULT**WHITE MATTER****OLD MAN**

Oligodendroglioma
Lymphoma
Dermoid
Metastasis
Astrocytoma
Neuronal tumors



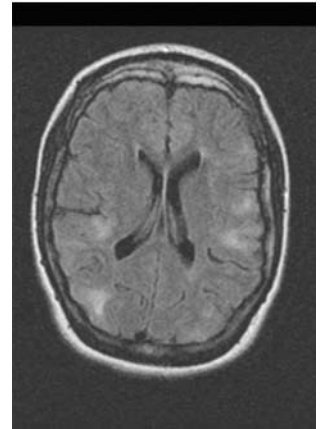
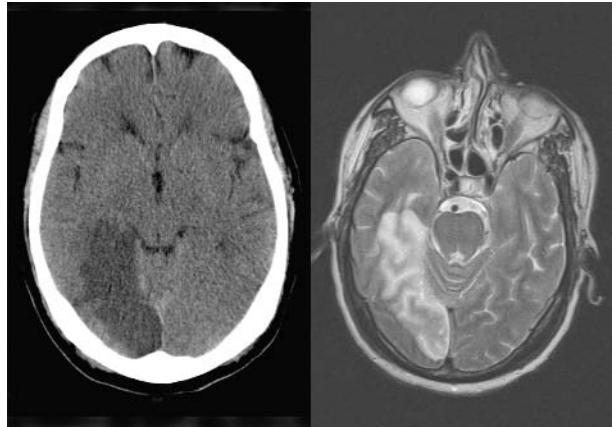
INFECTION



CORTICAL

TIGER TIM

Trauma
Infarct
Ganglioglioma/glioma
Encephalitis
Radiation
Tubers
Infection—toxoplasmosis
Metastasis



Infratentorial**CHILD***Cerebellum*

Medulloblastoma—(precontrast hyperintense)

Ependymoma—(Ca^{2+})(cystic)

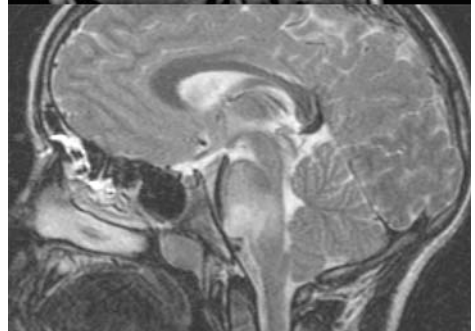
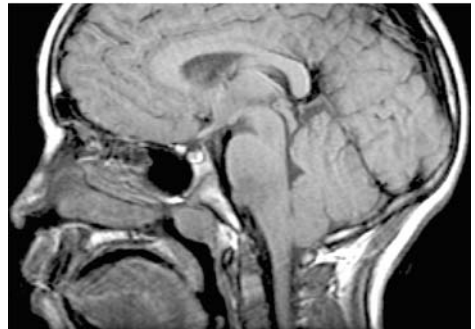
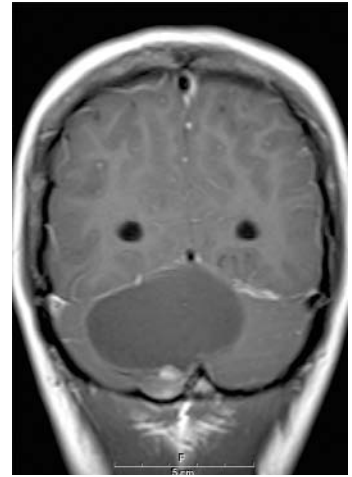
JPA

Mets

Choroid plexus papilloma

Brainstem

Brainstem glioma+tectal glioma



ADULT*Cerebellum*

Mets
Hemangioblastoma
Astrocytoma
Choroid plexus C/P
Lymphoma

*Brainstem***Tumor**

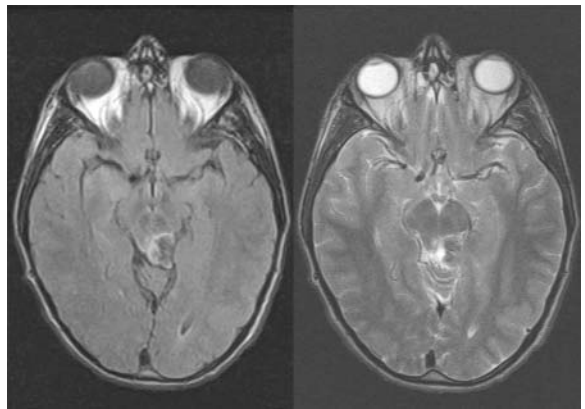
Metastasis
Brainstem Glioma

Infection

Tb
Abscess

Inflammatory/Vascular

Cavernoma/AVM
Infarct

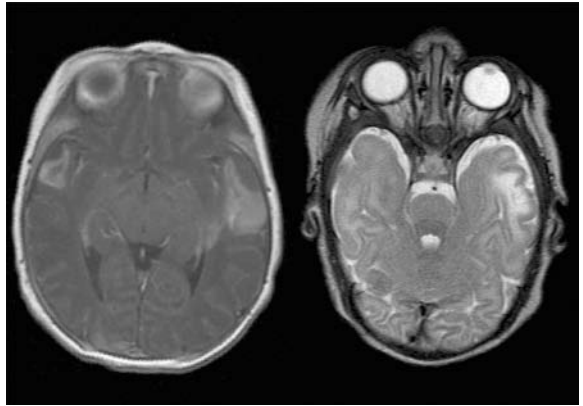
Demyelinating

TEMPORAL LOBE

Tumor: Ganglioglioma

Infection: Herpes

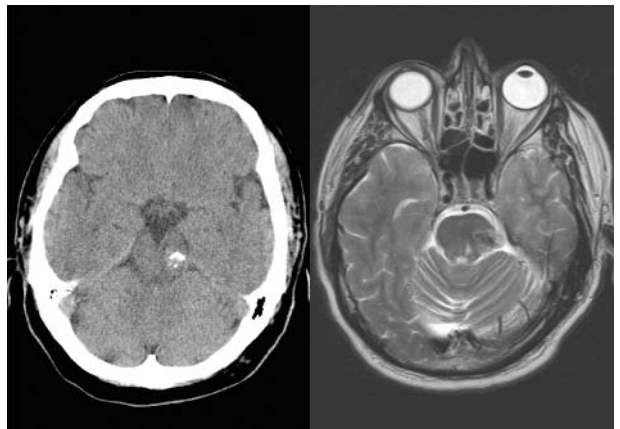
Vascular: Transverse sinus
thrombosis/infarct



CALCIFIED TUMORS

OLD ELEPHANTS AGE GRACEFULLY AND LIKE PEANUTS

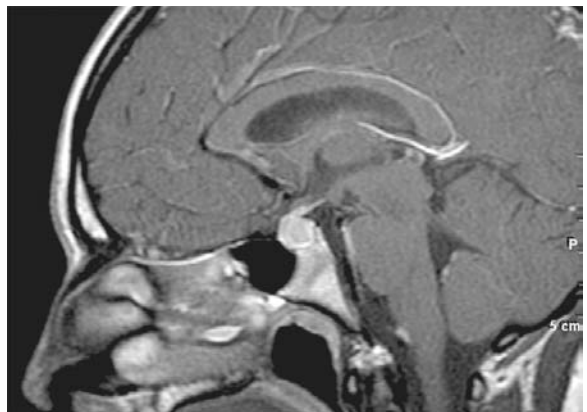
Oligo
Ependymoma
Astrocytoma
GBM
PNET



SELLAR

PC OR MAC?

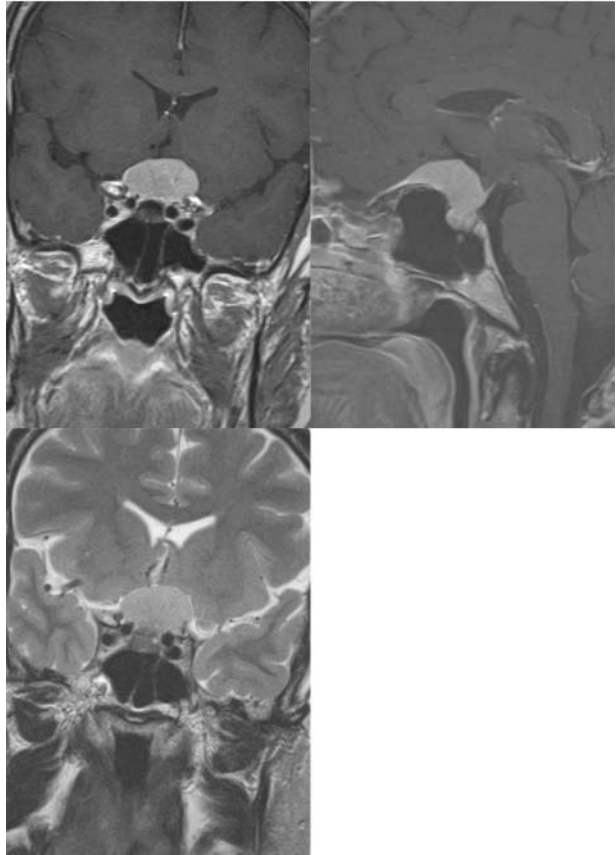
Pituitary adenoma/apoplexy
Craniopharyngioma
Mets/meningioma
Abscess/Aneurysm
Cysts—Rathke's cleft



SUPRASELLAR

SATCHMOE

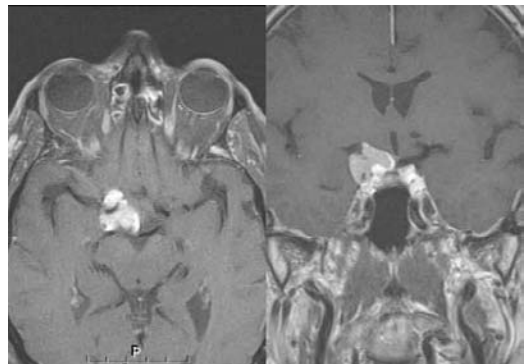
Sarcoid
 Aneurysm
 Teratoma/germinoma
 Craniopharyngioma
 Hamartoma of the tuber cinereum
 Meningioma/mets
 Optic glioma
 EG



PARASELLAR MASS

MCAT

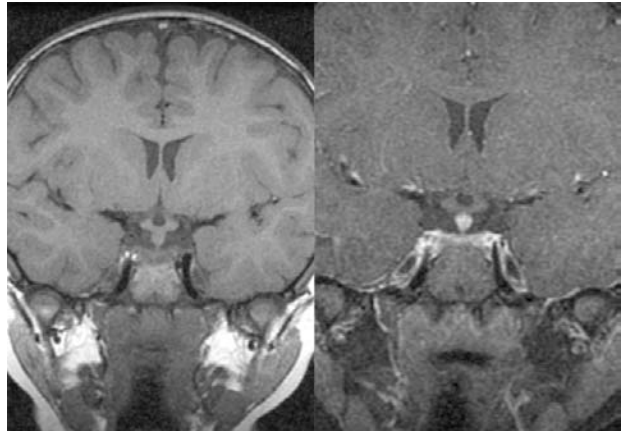
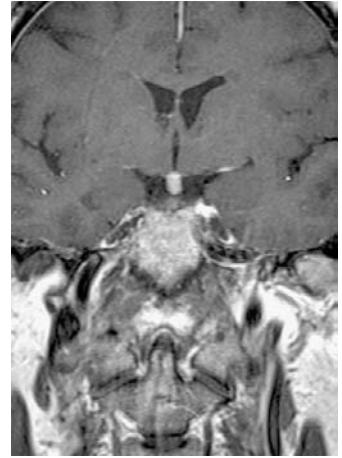
Meningioma/metastasis
 Cavernous carotid fistula
 Aneurysm
 Trigeminal Schwannoma/Tolosa-Hunt



INFUNDIBULAR MASS

MEET GIRLS

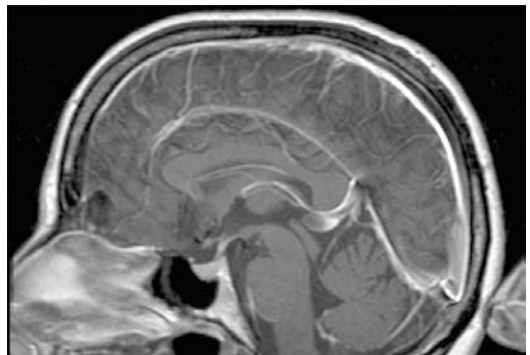
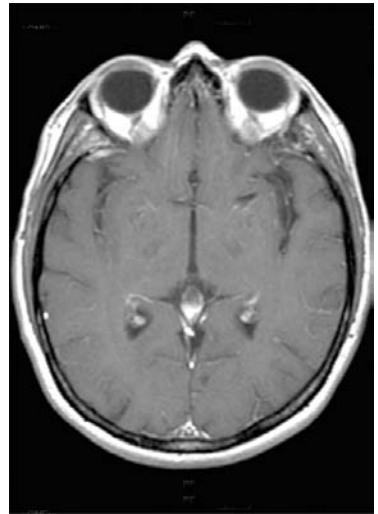
Metastasis
Eosinophilic granuloma
Germinoma/germ cell tumors
Infection/inflammation (hypophysitis)
DuRal—(think of dural-based conditions)
Lymphoma
Sarcoid



PINEAL MASS

MAD PIG

Meningioma/metastasis
Arachnoid cyst/Aneurysm/AVM
Dermoid/teratoma
Pineal parenchymal tumor
Pineal cyst
Germ cell tumor/Glioma



CP ANGLE

Slow GAME

Schwannoma: V and VII

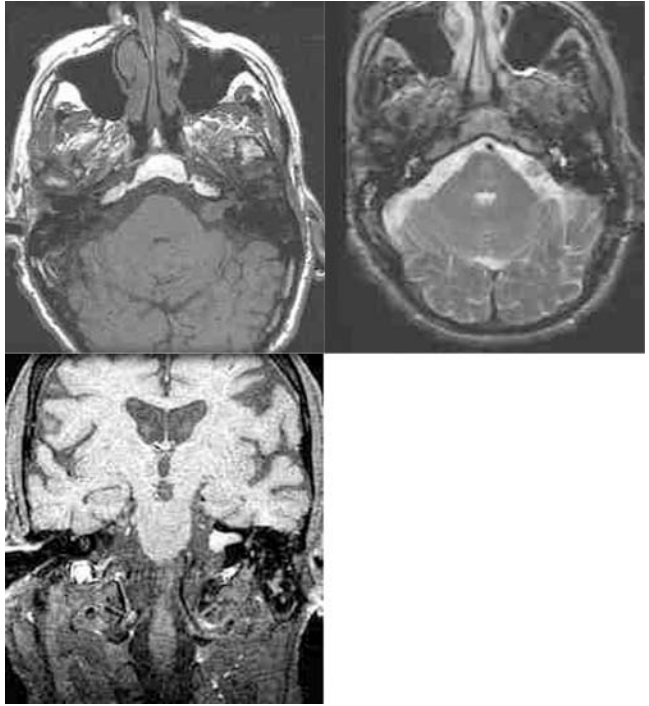
Lymphoma/lipoma

Glomus tumor

Aneurysm

Meningioma/Metastasis

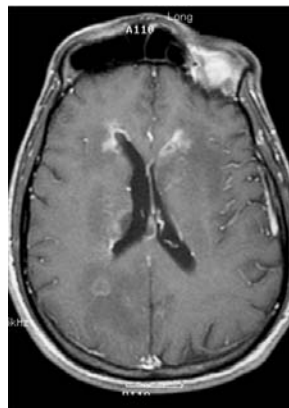
Epidermoid/Ependymoma



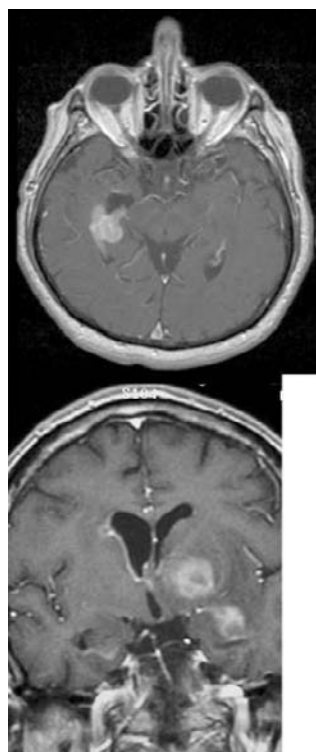
Ventricular Disorders

VENTRICULITIS

Infection—CMV/HIV/TB



Tumor—Carcinoma/metastasis/lymphoma



MASS

Adult

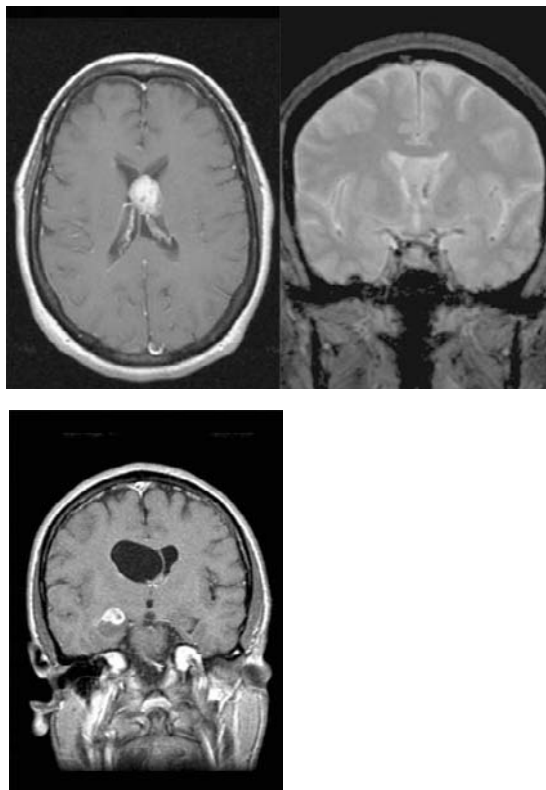
EMC²

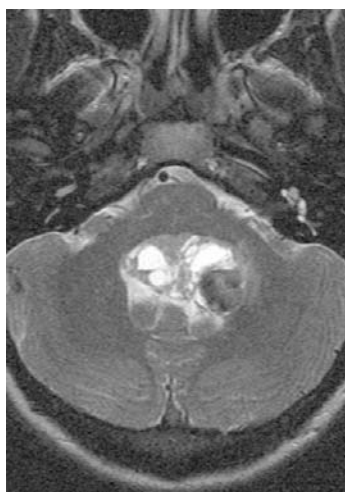
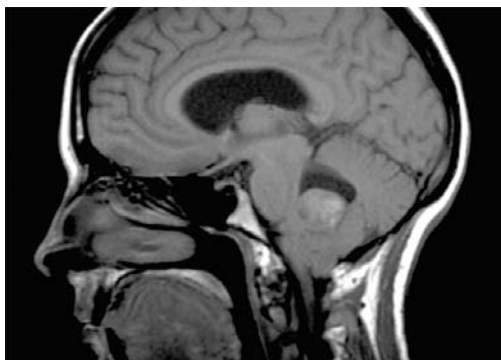
Ependymoma/Gliomas

Mets/Meningioma

Choroid plexus tumors

Central neurocytoma/Cystercercosis



Child**PETA (save animals)****PNET****Ependymoma****Teratoma****Astrocytoma**

HYDROCEPHALUS

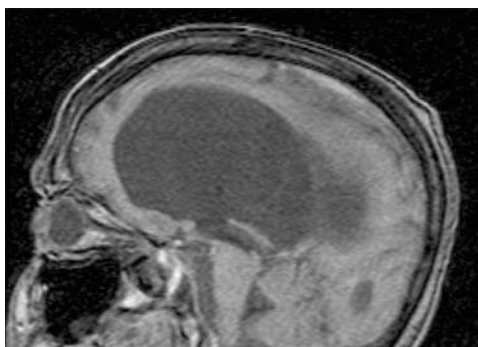
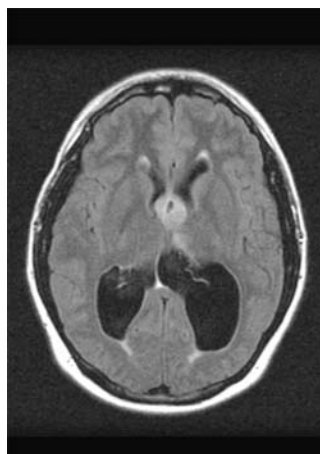
Communicating

NPH (wet, wobbly, wacky)
Meningitis
Post subarachnoid hemorrhage
Post surgery



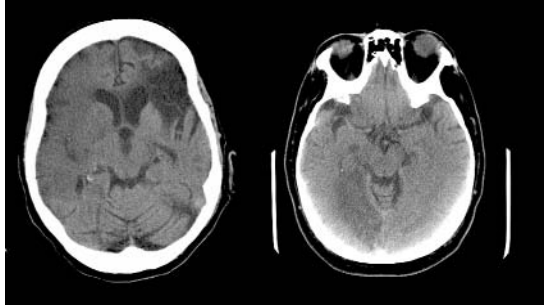
Noncommunicating

3rd ventricular mass
Aqueductal tumors/stenosis
4th ventricular mass

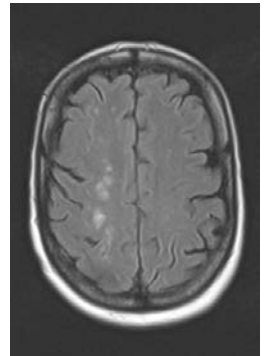


INFARCTS/STROKE

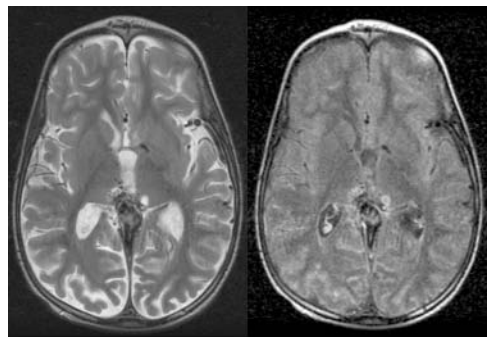
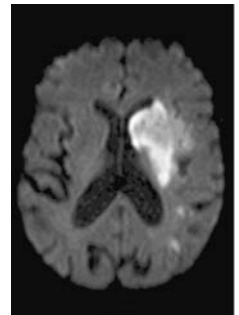
1. Large vessel—MCA/ACA/PCA



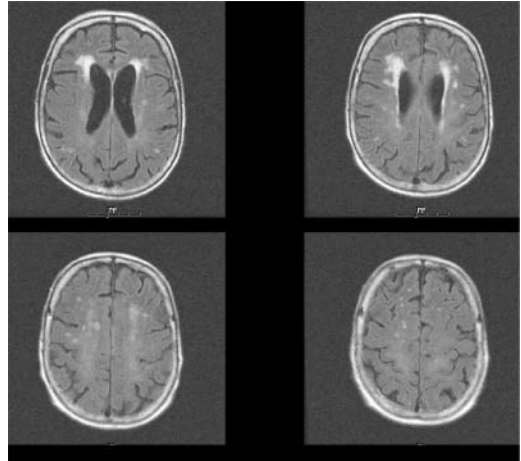
2. Watershed



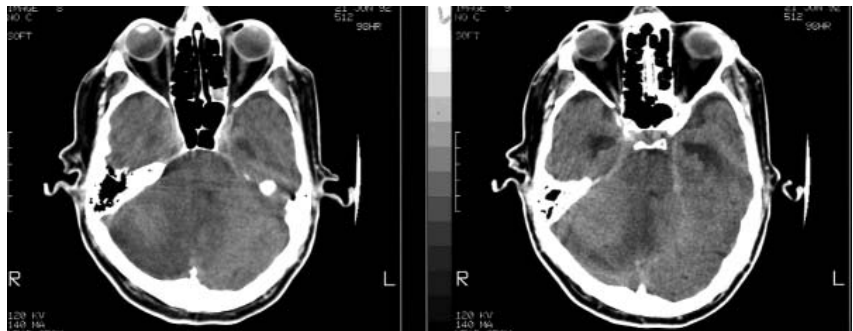
3. Small vessel disease—Lacunes, HTN



4. Microvascular—Leukariasis



5. Posterior fossa (may need to be decompressed)



ARTERIAL CAUSES

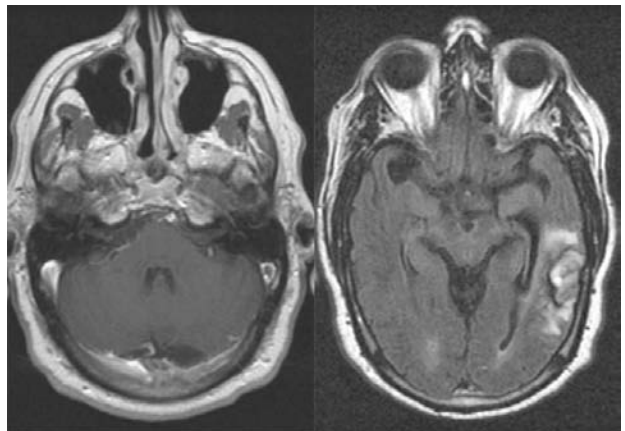
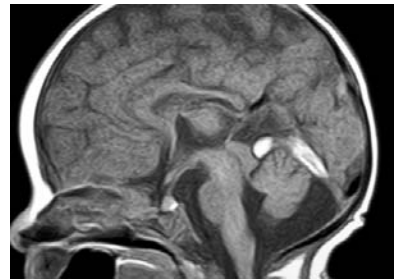
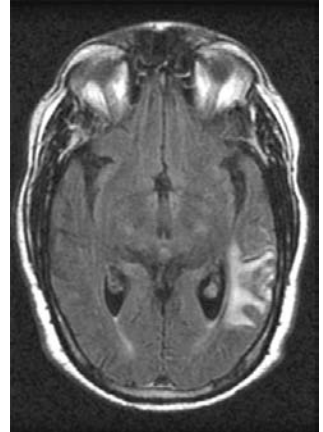
- Thrombosis/atherosclerosis
 - Check Circle of Willis/branch points
- Dissection—Check neck vessels
- Low flow—Check history
- Emboli—Drug history
- Vasculitis



VENOUS CAUSES

SHIPPED

Sickle cell
Hypercoagulable
Infarct
Infection
Pregnancy
Pill (oral contraceptives)
Endogenous—Factor V Leiden
Dehydration



INTRAPARENCHYMAL HEMATOMA

Young

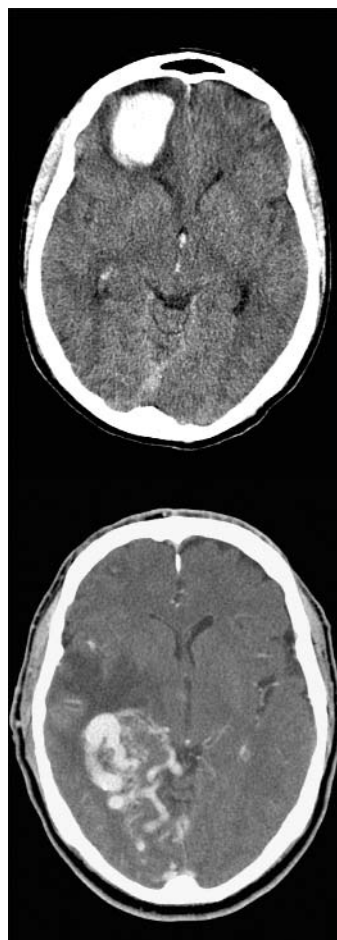
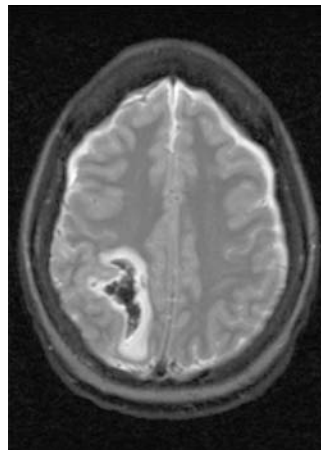
DATA

Drug abuse—Cocaine

Aneurysm

Tumor—Underlying

AVM/Vascular malformations

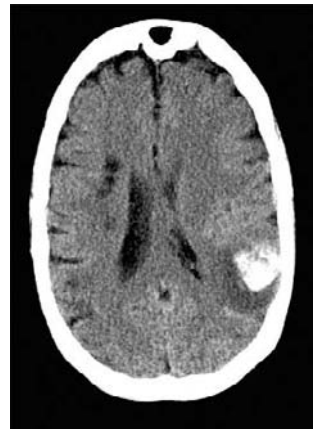
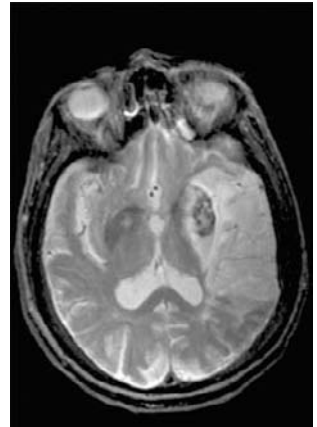


Old**HAT**

HTN—putamen/thalamus/pons/cerebellum

Amyloid/Anticoagulation

Tumor—primary or metastasis



RING-ENHANCING LESION

MAGIC DR

Immunocompromised

Toxoplasmosis vs lymphoma

Immunocompetent

Mets

Abscess

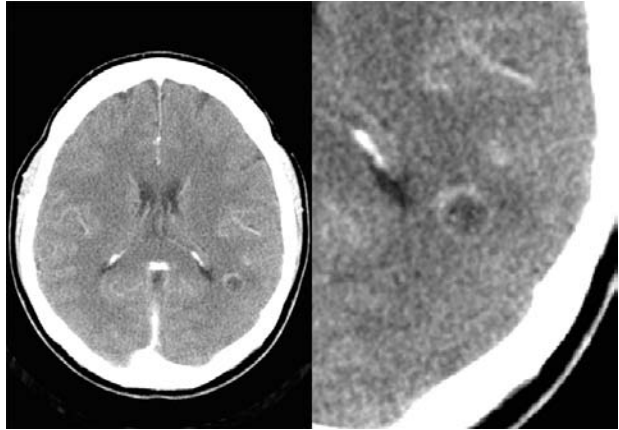
Glioma

Infarct

Contusion

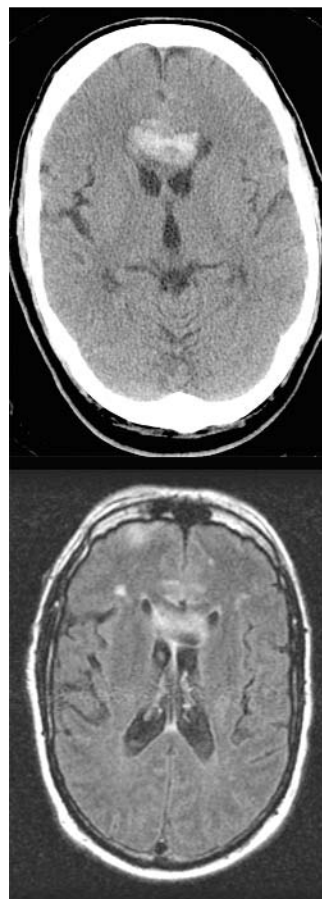
Demyelinating (MS)

Radiation Necrosis



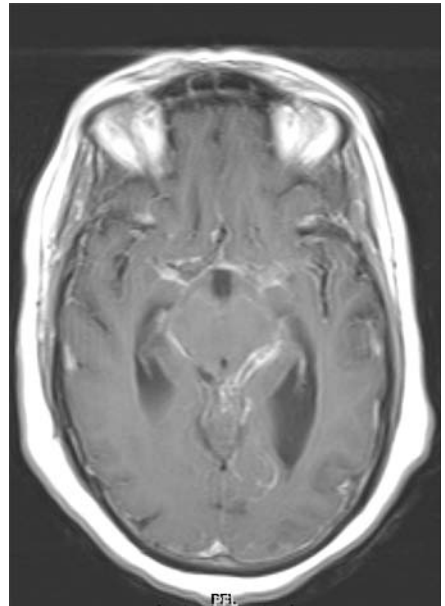
CROSSING LESIONS OF THE CORPUS CALLOSUM

Lymphoma
GBM
MS
ADEM/PML
Trauma
Metastases



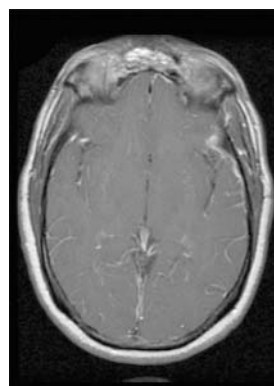
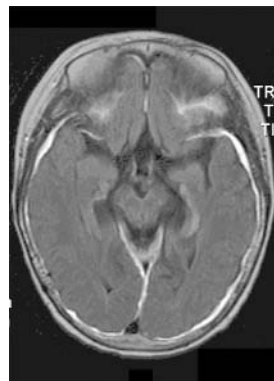
LEPTOMENINGEAL ENHANCEMENT

Carcinomatosis—breast/lung/melanoma
Infection—viral or bacterial meningitis/TB
Inflammatory—sarcoid
Consider subarachnoid hemorrhage
Spontaneous intracranial hypotension



DURAL ENHANCEMENT

Postoperative
Spontaneous intracranial hypotension
Metastatic disease—breast/prostate
Sarcoidosis

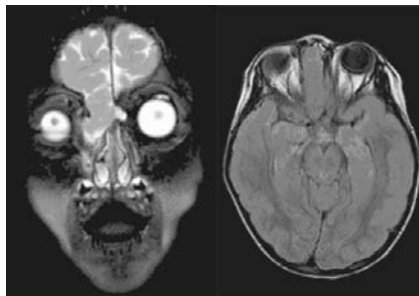


CONGENITAL

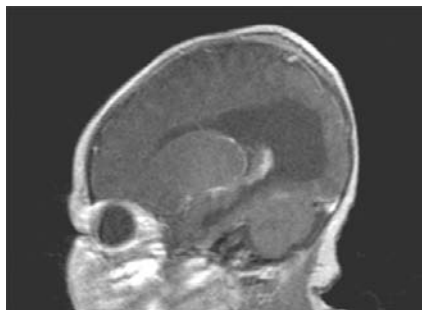
Children Complete Myelination at 2 yr of Age

DISORDERS OF NEURAL TUBE CLOSURE

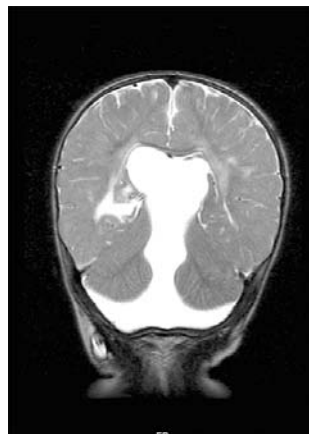
Cephalocele



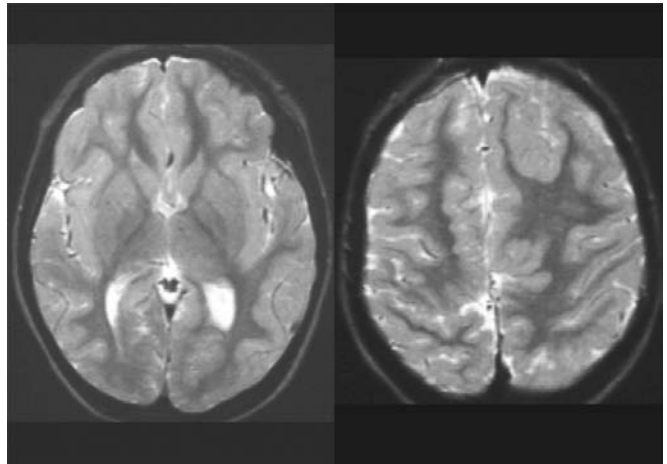
Corpus Callosal anomaly — Agenesis



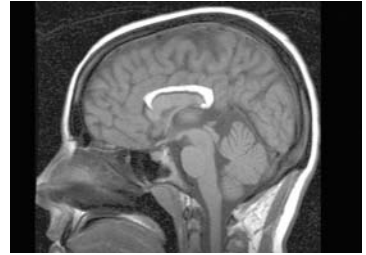
Dandy Walker malformation



Chiari II
Migrational disease



Idiopathic
Lipomas



Cysts—Aicardi's syndrome
Hydranencephaly
Porencephaly—toxoplasmosis



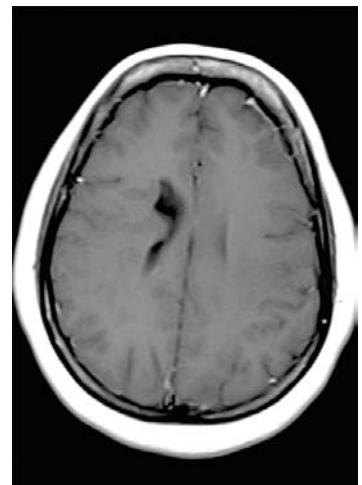
Dyke Davidoff Mason—unilateral atrophy

DISORDERS OF NEURONAL MIGRATION

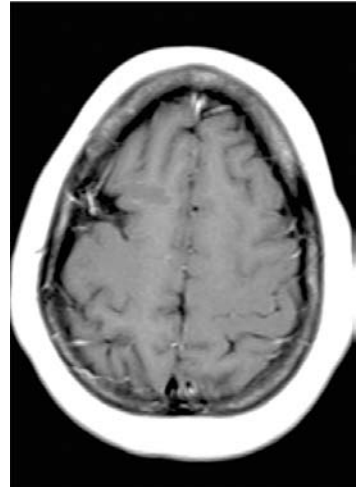
Lissencephaly
Nonlissencephalic cortical dysplasia
**ASSOCIATED WITH CMV—affinity for germinal matrix*



Heterotopia



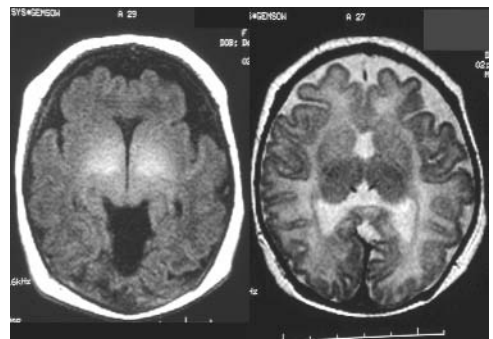
Schizencephaly



Unilateral megalencephaly

DISORDERS OF DIVERTICULATION

Holoprosencephaly



Septo-optic dysplasia



Absence of SP— **LOOK FOR SEPTO-OPTIC AND SCHIZENCEPHALY*

CYSTIC POSTERIOR FOSSA

DW Complex

DW Variant

MCM

Arachnoid Cyst



Cerebral Angiography

Angiograms shown in the Neuro section will be looking for specific diagnoses based on the region in which they are shown. These are:

ANGIOGRAPHIC DDX

AORTIC ARCH

Vessel Irregularity

Atherosclerosis



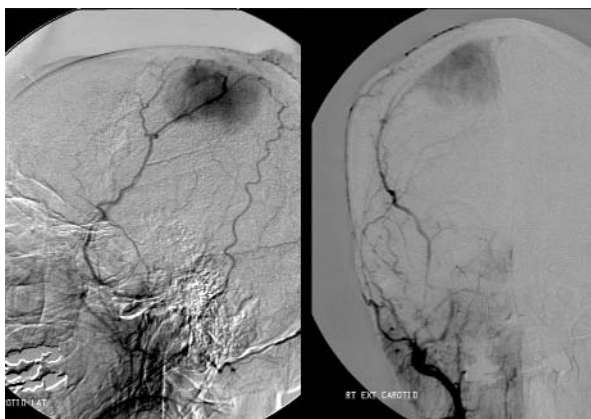
Vasculitis

Trauma

EXTERNAL CAROTID ARTERY

Tumor

Meningioma
Juvenile Angio



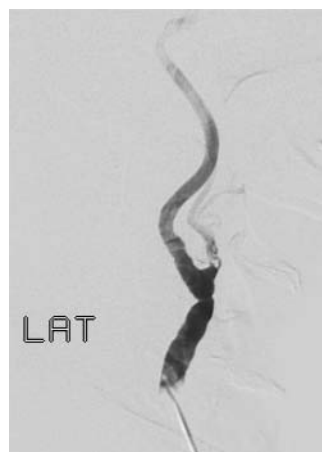
Chemodectoma



CERVICAL CCA/ICA/VERT

Vessel Irregularity

Atherosclerosis



FMD

Dissection

Trauma

Neoplasm

Paraganglioma

AVM—Dural-based**PETROUS INTERNAL CAROTID ARTERY**

Trauma

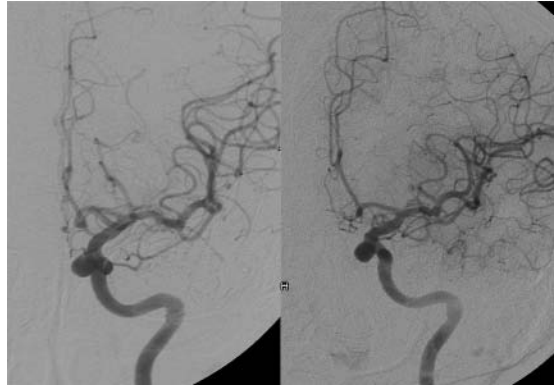
Aneurysm

INTRACRANIAL ICA

Aneurysm

CCF

Occlusion



CIRCLE OF WILLIS

Aneurysm

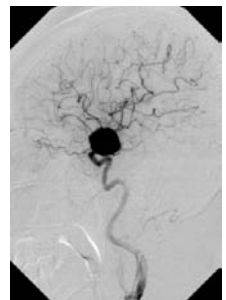
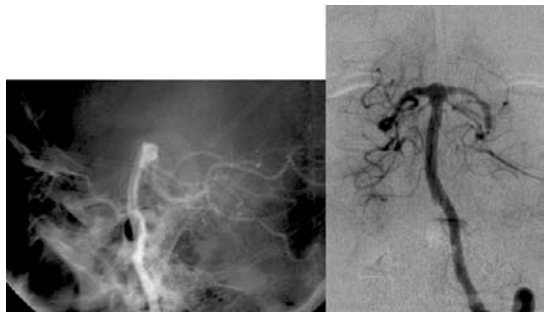
AVM

Stenosis

Tumor

Meningioma

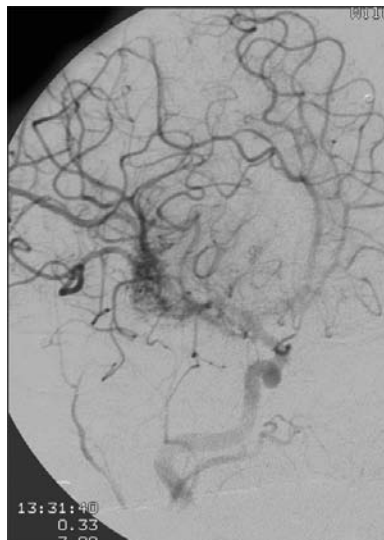
Hemangioblastoma



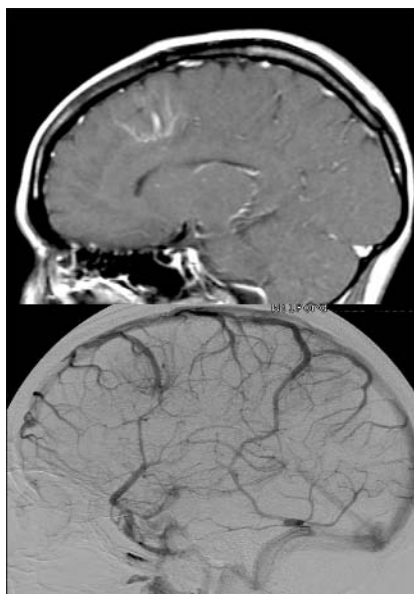
INTRACRANIAL

VASCULAR MALFORMATIONS

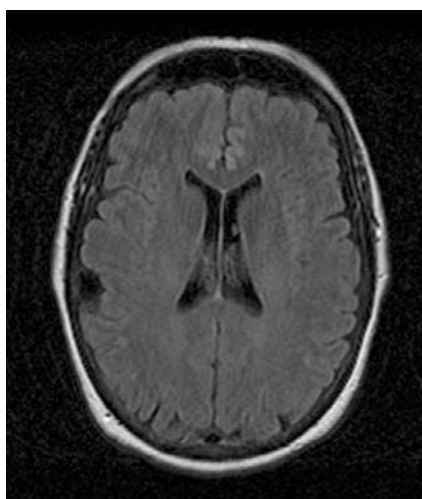
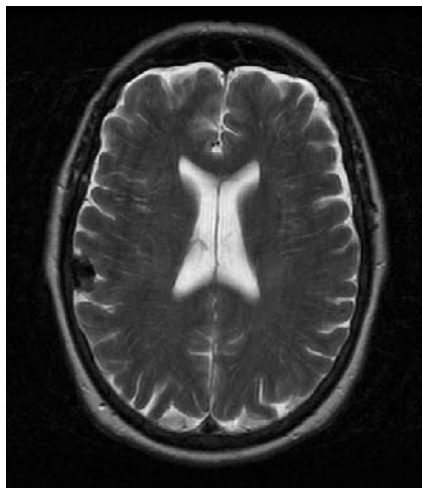
AVM—parenchymal/dural/cryptic



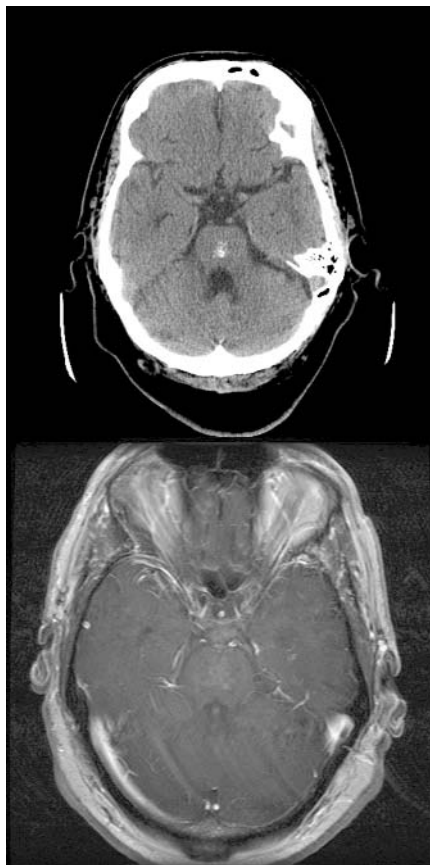
Venous angioma (deep venous anomaly)/cavernoma



Cavernous Angioma

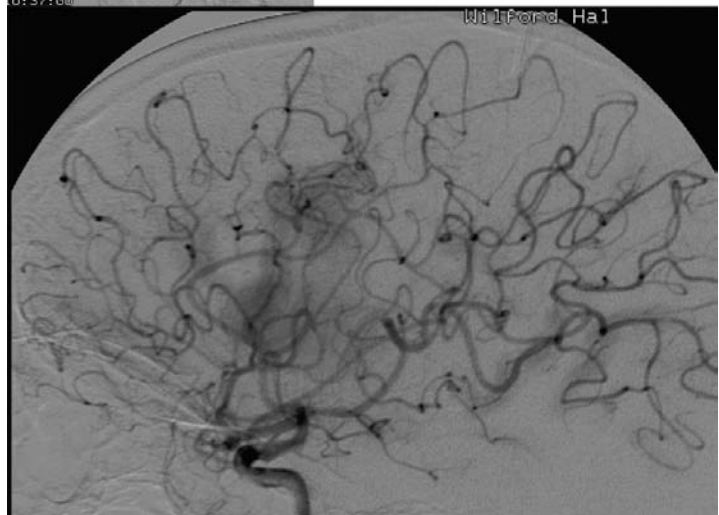
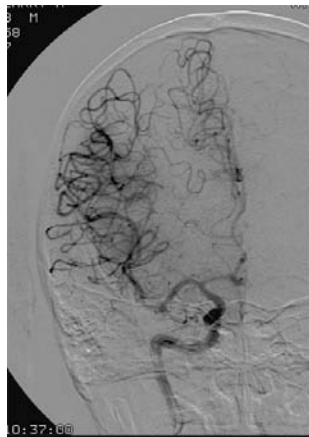


Capillary Telangiectasia



VASCULITIS

<i>Infectious</i>	<i>Noninfectious</i>	<i>Atypical</i>	<i>Nondrug</i>
TB	Cocaine	Drug ergots	Sarcoid
Syphilis	Amphetamine		Wegener's
			PAN



CHILDREN/INFANTS

Moya Moya

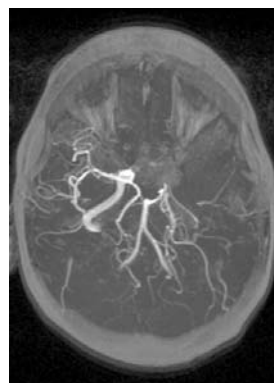
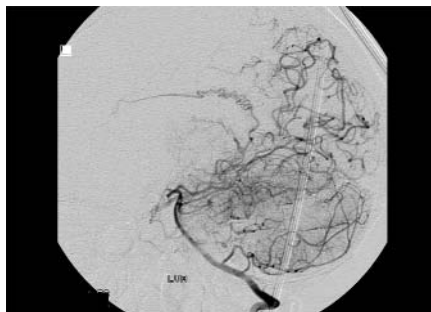
NF

Sickle

Radiation

Idiopathic

Vein of Galen malformation



CSF SEEDING

PAGE ME

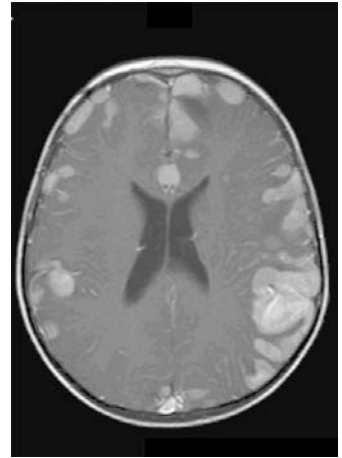
Papillomas—choroid plexus/carcinoma

Astrocytomas—GBM

Germinoma

Ependymoma

Medulloblastoma



BASAL GANGLIA Ca^{2+} HYPERDENSE ON CT/HYPOINTENSE ON T1**BIRTH**

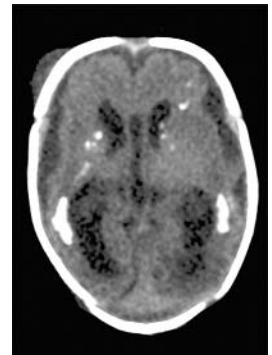
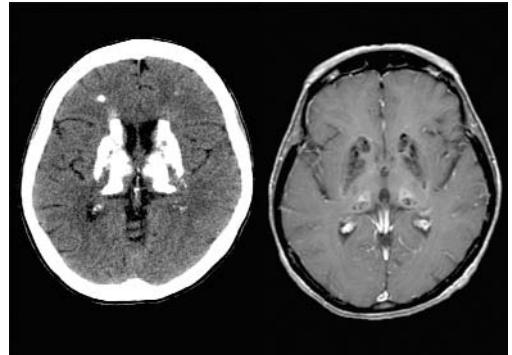
Birth Anoxia

Infection—HIV

Radiation

Toxin—Carbon Monoxide/Lead/TPN

Hypoparathyroidism/Hypophosphatasia

**BASAL GANGLIA DISEASES HYPODENSE ON CT/HYPERINTENSE ON T2****LINT**

Lymphoma

Infarction—hypoxia/hypotension

Neurodegenerative—Wilson's

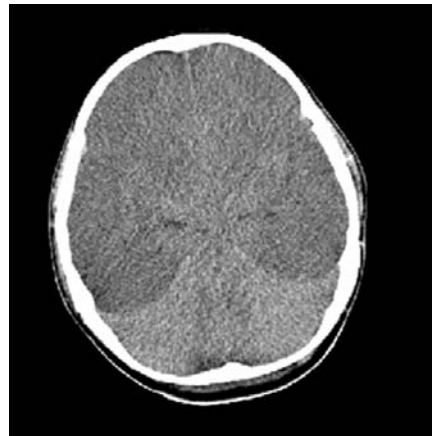
Toxins—Carbon Monoxide/Cyanide/Choloroethane



DIFFUSE CEREBRAL EDEMA

HIGH PRESSURE

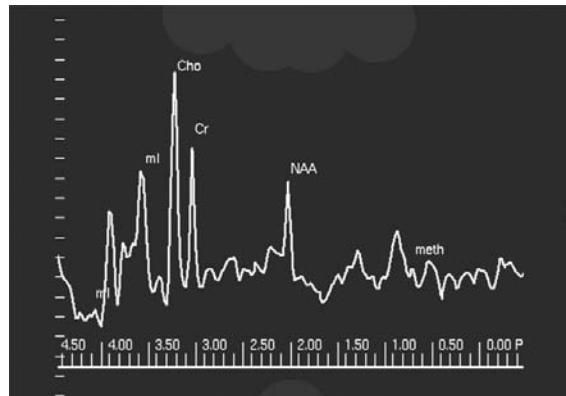
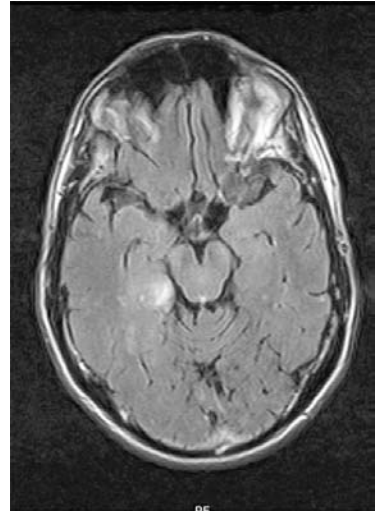
Hypertensive crisis
Pseudotumor
Reye's syndrome
Encephalitis
Sagittal Sinus thrombosis
Eclampsia



SPECTROSCOPY

Normal Spectrum

			X	
			X	
			X	
	X	X	X	X
	X	X	X	X
XXXXX	XXXXXXXXXXXX	XXXXXX	XXXXXXX	
Choline	Creatine	NAA	Lactate	



Rules of Thumb

1. Low grade tumor and demyelination can look identical.
2. Very high choline levels usually indicates tumor.
3. Infarct shows elevated lactate and decreased other values.
4. Increased lactate in the CSF can be seen in NPH.
5. Decreased NAA indicates neuronal loss (including neuronal loss seen in tumor).

Spine

INTRADURAL INTRAMEDULLARY

AHEM, MIGHT I help you?

Astrocytoma
Hemangioblastoma
Ependymoma
Mets

MS
Infection/myelitis
Granulomatous – sarcoid
Hemorrhage
Trauma



INTRADURAL EXTRAMEDULLARY

DAMN VASCULAR HEMATOMA

Dural mets
AVM/arachnoid cyst
Meningioma
NF/Schwannoma

Vascular
Hematoma



EXTRADURAL EXTRAMEDULLARY

SMALL HEAD

Synovial cyst

Mets/Meningioma/Schwannoma

AVM

Lymphoma

Leukemia

Hematoma

Epidural Abscess

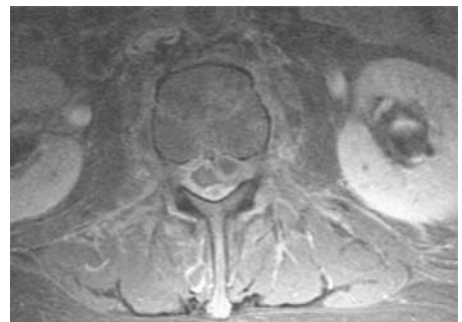
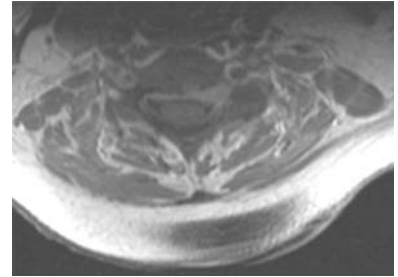
Adenopathy

Disk

Bulge

Herniation—Extrusion/Protrusion

Free Fragment



ARACHNOIDITIS

Failed back syndrome
Subarachnoid hemorrhage
Infection
Pantopaque

